

Reconnecting to a Forgotten River

An Ecological Solution

Design Thesis | Aaron Hanson



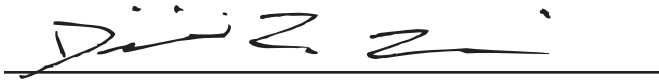
Reconnecting to a Forgotten River

A Design Thesis Submitted to the Department of
Architecture and Landscape Architecture of North
Dakota State University

By

Aaron Hanson

In Partial Fulfillment of the Requirements for the
Degree of Bachelors of Landscape Architecture

A handwritten signature in black ink, appearing to read "David Z. Z.", written over a horizontal line.

Primary Thesis Advisor

A handwritten signature in black ink, appearing to read "Arthur D. Wiley", written over a horizontal line.

Thesis Committee Chair

May, 2012

Fargo, North Dakota

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abstract

Waterways are a vital and productive resource to our environment. Rivers provide a variety of amenities and services to communities across the world such as drinking water, food, travel, recreation, wildlife habitat, connection to place, aesthetic appeal, economic development, etc. This thesis project examines the importance of the Mississippi River to its urban community and how riverfront design can function as a unifying element for the city center and its ecosystem. Over half of the world's future population will be living in urban environments by 2030, which will dramatically increase the stress on a vulnerable network of water systems. A restoration of a river can bring awareness to people while improving physical and ecological corridor connections (Bernhardt & Palmer, 2007).

Keywords: Mississippi, river, community, ecosystem, restoration, urban, connection

problem statement

How can riverfront design be used to unify an urban core to the Mississippi River's natural ecology?

statement of intent

Project Typology

A river in an urban environment.

Claim

The Mississippi River is a vital resource to nearby cities and its resilience is often undermined by unsustainable development techniques in the urban environment. Landscape architecture is capable of healing our injured riparian ecosystem by making people aware of this issue through design strategies focused on unifying people to the river.

Premises

Actor: Landscape architects, planners, and natural resource management practitioners have the ability to restore a river's natural ecology.

Action: Revitalization techniques should be used to coincide with the urban environment and the river's natural habitat.

Object: Mississippi Riverfront in downtown St. Cloud, Minnesota.

Theoretical Premise | Unifying Idea

A city sensitive to its riverfront will provide strong connections and benefits for urban dwellers and the natural ecology. A system of strategies can be integrated to create an effective waterfront restoration that provides a unified living society between people and the natural environment.

Project Justification

Incorporating community connection through an ecological solution can provide amenities and aesthetic values that will unify an urban center. Instead of having the environment adapt to us, it is essential that we adapt to it and live within an ecosystem's natural process.

narrative

I grew up on the countryside of a rural community near a small river that connected a few towns along its route. I spent most of my childhood outdoors doing various activities along this memorable river. It hadn't occurred to me at the time how truly connected I was to the river's ecological setting until I began living in an urban environment.

In many urban cities there is little connection between the ecology of a river and its urban dwellers. Many urban settings include built infrastructure with poor connections to natural elements and/or paying little attention to the river.

Why is there a missing connection between the river and its urban setting? Is it because cities have turned their back away from the river? How can landscape architecture help urban communities reconnect to a river?

An ecological restoration can restore the missing link between people and a river. Creating areas of interest and activities through green space design can create opportunities for stormwater infiltration, alternative transportation uses, and educational elements. The goal is to use the river corridor to unify urban communities and in doing so, promote a sustainable future for our ecosystem while providing economical and cultural growth.

user | client description

CLIENT

The client is the city of St. Cloud and other organizations working with the wildlife, habitat, and ecology of the Mississippi River, specifically the Department of Natural Resources (DNR) and the Mississippi Interstate Cooperative Resource Association (MICRA).

USERS

Urban Dwellers

This user group will be local residents and college students who live within a mile of the Mississippi River in St. Cloud. This group can use alternative transportation, bike, or walk to the site. Amenities created for them include biking and walking routes, public transit access, eating availability, open green areas, designated fishing spots, ADA accessibility, and connections to the urban fabric. Further research will determine the quantity of urban dwellers, but anticipated peak usage will be spring, summer, and fall. However, it will be important to add winter value, which will create a year-round riverfront usage for the community.

Water Recreationalists

This user group will be water recreationalists who may live in or away from St. Cloud or up or down stream along the Mississippi River. Anticipated peak usage will be in the summer for enjoying the river with boats and other water vehicles, canoes, kayaks, paddleboats, etc. As a result, this user group will need easy access to the river, boat landings, parking, green areas, eating availability, informational kiosks, and other destinations. Further research will determine the quantity of water recreationalists; however, enhancing the quality of one's experience with the Mississippi will be essential in raising the economic vitality of St. Cloud.

Tourists | Nature Enthusiasts

An attraction will be designed to incorporate tourist and nature enthusiasts to the area. It is anticipated that this user group's peak usage will mainly be in spring, summer, and fall for fishing, sightseeing, hiking, and wildlife viewing. As a result, these users will need trails, overnight stay accommodations, green areas, destinations, ADA compatibility, informational kiosks, parking, and eating availability. Further research will determine the quantity of tourists and nature enthusiasts; however, increasing the amount of this user will bring social and cultural aspects to the city that are currently lacking and will raise the value of St. Cloud's economy.

major project elements

Greenways

A series of greenways will be used to connect the river corridor to the urban fabric of downtown St. Cloud. To unify these green areas, the use of hard and natural trails will be used to provide direct walking and bicycling routes along the river. Green areas will address stormwater runoff, erosion control, and wetland filtration to enhance the water quality of the Mississippi River.

Destination Areas

These areas will include future and existing parks, plazas, and areas of interest. Major emphases will be to attract people to and along the riverfront of the Mississippi River. These areas will need to incorporate overnight sleeping (hotels, campgrounds), parking, eating areas (restaurants, picnic areas) by either providing or connecting to existing destinations.

Recreational Elements

There will be multiple recreational elements carried throughout this design process in order to draw people to the river and promote interaction with the water. Potential design elements include fishing piers, docks, rental stations for canoes, kayaks and paddleboats, boat landings, water access areas, and swimming areas. Further research will determine the need and location of these different elements along the Mississippi River.

Educational Elements

In order to fully understand the importance of water quality and existing conditions, informational kiosks and interpretive art will be used to inform people of the ecological restoration taking place. This may be implemented by showing users the effects grey water has on natural ecosystems. An example of this can include a series of filtration viewing areas that would clean stormwater runoff before it enters the river. Developing public awareness will promote further protection of the Mississippi River's ecology.

site information

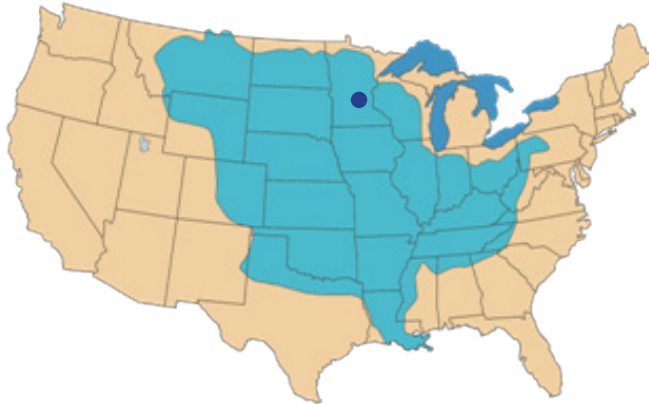


Figure 1. Mississippi Watershed.

The Mississippi River begins at Itasca State Park, Minnesota, and releases at New Orleans, Louisiana, into the Gulf of Mexico. The Mississippi River Basin is the fourth largest watershed in the world and is the largest watershed in the U.S. The watershed measures approximately 1.2 million square miles, draining all or part of 31 states and 2 Canadian provinces, according to the MICRA (“MICRA Rivers,” 1991).

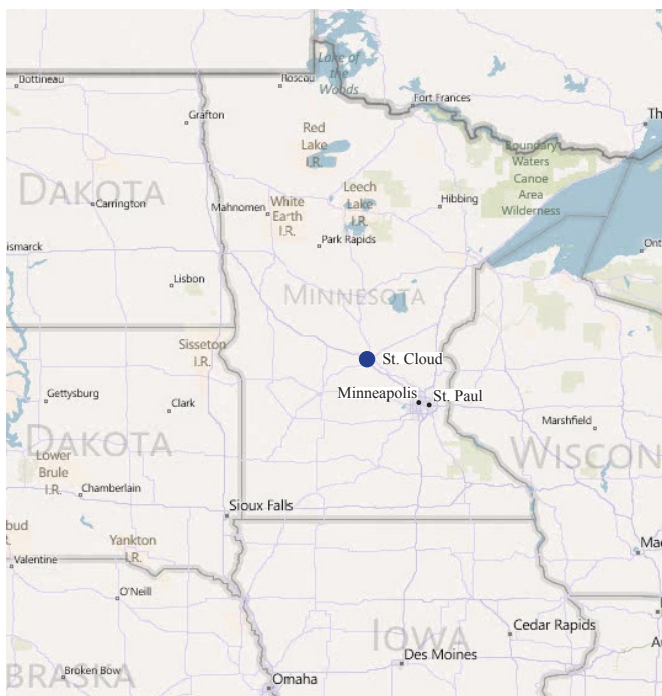


Figure 2. Surrounding States.

This project site’s emphasis is a 12 mile stretch along the Mississippi River corridor that connects the cities of Sartell, Sauk Rapids, and St. Cloud in Minnesota. These cities are growing, and it is estimated that by 2020, there will be 20,858 more people living within them. The population rising means greater urban runoff and pollution in the river. It is important to enhance and preserve the water quality at the beginning of the Mississippi River’s tributary.

site information

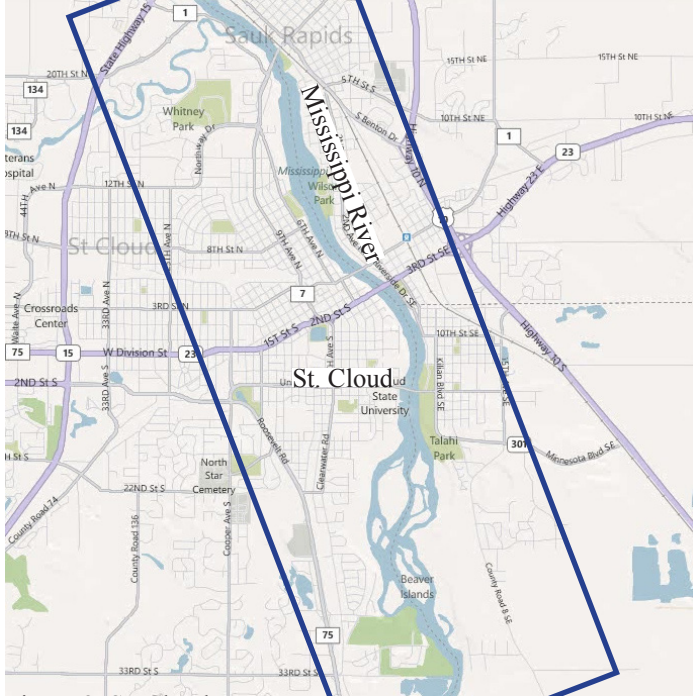


Figure 3. St. Cloud, MN.



Figure 4. St. Cloud, MN.

Specifically, this project will look at enhancing a one mile stretch of riverfront in downtown St. Cloud.

project emphasis

The major emphasis of this project is the social and ecological quality of the Mississippi River corridor in downtown St. Cloud, Minnesota. The goal is to implement a riverfront design that will reconnect the urban community to the river's natural environment. In order to successfully complete this task, a strategic plan will be implemented that includes recreational and educational elements, greenways, and community destinations used to unify St. Cloud's ecosystem along the Mississippi River. Instead of St. Cloud turning its back on the river, this thesis will look at refocusing the urban center towards the riverfront; in return, it will provide economical, social, and ecological benefits to the city of St. Cloud.

plan for proceeding

Research Direction

This thesis will use in-depth research in both qualitative and quantitative data to guide its development. Research will be conducted in areas following the theoretical premise, project typology, historical context, site analysis, and programmatic requirements.

Design Methodology

The method that will be utilized is a mixed-method approach, which uses both quantitative and qualitative data. Analyzing, interpreting, and reporting results will occur throughout the research process and will be presented in both text and graphics. The research will be guided by the theoretical premise. Quantitative data will include statistical and scientific data gathered through local surveys and archival searches done by the city of St. Cloud. Qualitative data will be gathered from direct observations and archival searches.

Documenting Design Process

All research and design for this project will be compiled and documented digitally. The design process will be documented with photos, graphics, drawings, and research findings.

Final Documentation

The final conclusion of this thesis will be presented through a digital presentation. All of the research, text, and graphics will be documented in a bound hardcopy as well as a digital file that will be made available at the NDSU's library for future use.

previous studio experience

Fall Semester | 2008 | Kathleen Pepple

Sumi & Haiku Painting

Tea House & Garden Protect | Fargo, ND

Halverson Park | Battle Lake, MN

Spring Semester | 2009 | Mark Lindquist

Cold Smoke, Bison Turf | Fargo, ND

Aubrey Green Protect | Winnipeg, Canada

NP Ave. & 1st Ave. Project | Fargo, ND

Fall Semester | 2009 | Stevie Famulari

Defiant Garden Project | Fargo, ND

Regent Project | Regent, ND

Fargo Analysis | Fargo, ND

Snow Symposium | Winnipeg, Canada

Spring Semester | 2010 | Kathleen Pepple, Jason Kost

Roosevelt Project | Fargo, ND

UTTC Plan | Bismark, ND

Fall Semester | 2010 | Jason Kost

Figure Ground Study | Ciaro, Egypt

Conventional Zoning | Fargo, ND

Form Based Zoning | Fargo, ND

Duluth Urban Redevelopment | Duluth, MN

Spring Semester | 2011 | Stevie Famulari

Phytoremediation | Fargo, ND

HESCO Barriers: Window Well Protection | Fargo ND

Fall Semester | 2011 | Dominic Fischer

Red River Basin Watershed Study & Design | MN, ND,
SD, Manitoba

theoretical premise research

Human's Historical Connection to Rivers

History has shown how North America has relied heavily its water network systems. With cities developing around rivers for more than four centuries, streams have faced tremendous amount of pressure because of urban settlements (Otto, McCormick, & Leccese, 2004). Since the early 19th century, a major element of North American rivers has been the transportation of goods. According to Wrenn (1983), covered wagons would transport goods from the coasts to the Ohio and Mississippi Rivers; then the goods would travel 1,800 miles downstream to the coast of New Orleans (as cited in Otto et al., 2004).

When railroads took over transportation, the river corridors became less important to social and retail space. Typically, riverfront land was expanded to make room for rail infrastructure and warehouses which dominated many cities' waterfronts by the early 20th century (Otto et al., 2004, as cited in Wrenn, 1983). However, through this waterfront shift, urban riverfronts were still vital as the economic center of cities. "Throughout the nineteenth and twentieth centuries, river cities... have grown in a relatively consistent pattern. Because this pattern has determined today's riverfront land uses and will deeply influence future urban development patterns, uses and functions, it is important for planners to understand the history of river town expansion" (Otto et al., 2004, p. 2).

History also shows the value of urban waterfronts and how they became important to designers like Frederick Law Olmsted Jr. In the early 1900s, many waterfronts were dominated by industrial and factory buildings, causing a disconnection between people and their natural waterways. Since then, waterfront industries have been abandoned and this loss provides a rare opportunity to reconnect people to green environments and to the calm inevitability of water. Olmsted Jr. recommended protecting ecosystems against harmful human intrusion while opening up natural environments for large number of people to enjoy (Garvin, 2000). An example of this is recognized with the Ping Tom Memorial Park, created in 2000 and located in the Chicago Park District: It was originally used by surplus railroad property boarding the river and was transformed into a public parks system.



Figure 5. Ping Tom Memorial Park, Chicago, 2000.

theoretical premise research

Similarly, in Denver, Colorado, Cherry Creek was “once a manufacturing and warehousing haven” (Garvin, 2000, p. 47), and in 2000, it was converted into a park system with bike, running, and rollerblading paths, becoming one of the city’s greatest amenities (Garvin, 2000).



Figure 6. Cherry Creek, Denver, CO, 2000.

A major problem with rivers is that they can be prone to flooding. One can look at this situation in two ways: an engineering perspective of function over form approach with low up-front cost, or a more holistic landscape design approach that factors in sustainability and future economical impacts. An example of an engineering approach is the Los Angeles River, which in 1938, the U.S. Army Corps of Engineers developed a controlled water system for moving water as fast as possible. The water system only incorporating the removal of flood water, a single function. This was effective for immediate results but wasn’t sustainable for the future of the city. Now, the Los Angeles River is looking to reclaim its river by using revitalization techniques and converting the river corridor into a network of parks, pedestrian trails, and water access points (Otto et al., 2004). This is costing much more money than it would have had they analyzed the river with a strategic landscape architectural approach.



Figure 7. Los Angeles River, 1996. Much of the river flows through fenced-in concrete culverts with “no trespassing” signs (Garvin, 2000, p. 55).

theoretical premise research

A better solution is the San Antonio's Paseo del Rio (Riverwalk), 1941, which strategically transformed a flood hazard into a major tourist attraction (the second most visited area in Texas). It provides an aesthetically pleasing public park system that solves flooding problems while providing green relief. It is a model for adaptive re-use of waterfronts; its upfront cost may have been expensive but has paid off by raising the value of the city (Garvin, 2000).

Another similar situation occurred with Boulder Creek, located in Colorado. In 1983, the city finally used Frederick Law Olmsted Jr. and Charles Eliot's earlier recommendations (Improvement of Boulder Colorado Plan) to create an area that controlled flood water while providing public park systems for fishing, picnicking, and other recreational uses. Olmsted Jr. and Bartholomew recommended a similar solution for the Los Angeles River in 1930, but instead, the city of L.A. used an effective but unsustainable engineering approach (Garvin, 2000).



Figure 8. Boulder, Colorado, 2000. The Boulder Creek floodplain includes tree-lined pathways used for skating, jogging, and bicycle riding. Top right shows a local fisherman at his favorite fishing spot along Boulder Creek (Garvin, 2000, p. 56).

Conclusion

Fortunately, recent years have led to a wholistic view on rivers and water systems where even an engineering approach of function over form is changing to account for ecological benefits. Comparing the Los Angeles River and San Antonio River, where both had similar situations back in the mid 1900s, it is interesting to see the outcome of the chosen strategies. San Antonio's river has been thriving through the years while the city of Los Angeles is realizing the opportunities their river can bring.

theoretical premise research

It is important to look deep into the history of a city's river to know where the city has been and to know the influence a river may or may not have had on the city. Studying the Mississippi River further through research will determine how St. Cloud has viewed its river and if there is something to restore from the past. If St. Cloud has been historically founded by the great river, it should be part of the city's identity.

Population Increasing

It took an estimated 1 million years for the human species to number 1 billion people, reached in the mid-1800s; today, we near 7 billion and can roughly add another billion about every fifteen years (Kellert, 2005). Where do all these people live? Around two-thirds of the developed world lives within a metropolitan area, and this migration to urban cities is dramatically increasing. According to *Restoring Streams in an Urbanizing World*, over half of the world's future population is expected to dwell in an urban setting by the year 2030 (Bernhardt & Palmer, 2007).

Why is this relevant? With population on the rise and agreeably the greatest human migration in history, according to Kellert (2005), urban city environments will face greater challenges than ever before. St. Cloud and other urban cities will face an increase of impervious surfaces, infrastructure, resource consumption, pollution, and waste. These rises will dramatically impact natural water systems like the Mississippi River by increasing urban run-off and consumption of freshwater resources, resulting in water pollution and lower water quality.

Currently, urban cities consume 40% of energy resources, 30% of natural resources and 25% of freshwater resources while generating one-third of air and water pollutants and 25 percent of solid wastes (Kellert, 2005). Environmental degradation is already happening and is expected to increase from rising population; creating an opportunity to protect urban environments while reconnecting people to the inevitable joy rivers bring to communities will strengthen an urban core.

The Human-Nature Connection

Designing cities within their natural ecosystem is not only important because it forces civilizations to have environmentally friendly principles like stormwater management, sustainable design of buildings and landscapes, etc., but also because it provides contact with nature. Interaction with nature has been proven to enhance human well-being and development. According to Kellert (2005), "Human physical, mental, and even spiritual well-being relies on experiencing healthy and diverse natural systems" (2005, p. 9). When creating natural ecosystems within an urban setting, designing for interaction with nature will be a key element for a city's success.

theoretical premise research

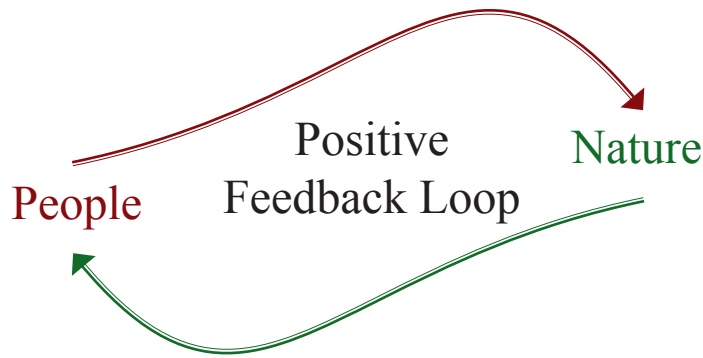


Figure 9. Relationship between Human and Natural Systems. (Kellert, 2005, p. 10)

It is in human DNA to be connected with nature, and one can see how people may subjectively incorporate it in their daily lives by the forms, patterns and language of everyday life (Kellert, 2005). Whether one realizes it or not, nature influences the stories people tell, the places they live and visit, the recreational activities they do, food they consume, and the materials they use. “Despite the evident connections, contemporary society still fails to recognize and defend the importance of healthy and diverse natural systems to sustaining the quality of people’s lives, especially in urban areas” (Kellert, 2005, p. 3). With deliberate design, the connection between humans and nature can be repaired and restored.

A city’s river provides a great opportunity where this connection can be fulfilled. Currently, many urban cities are isolated by buildings and infrastructure without regard for the natural environment due to poor conventional design. It is important for urban communities to expose parks, open space, and natural settings for stress relief, emotional well-being, and intellectual functioning (Kellert, 2005). A study conducted by social scientist Terry Hartig and his colleagues examined the emotionally restorative and intellectually enhancing effects of park-like settings in urban areas. The study surveyed college students and concluded that the “greatest gains in emotional restoration (higher levels of positive and lower levels of negative affect), as well as greater attentiveness and concentration, occurred among students who walked in the park and the study found significantly lower levels of emotional and intellectual restoration occurred among the ‘urban activity’ and ‘indoor activity’ groups” (as cited in Kellert, 2005, p. 14-15).

River corridors also provide recreational activity opportunities, which can enhance people’s physical and mental well-being. According to Kellert (2005), research has suggested that “outdoor recreational activity can exert significant and even life-changing effects on participants, particularly late adolescents, when substantial challenge and adventure occur in the company of others” (p. 16).

theoretical premise research

Alan Ewert, an outdoor recreational researcher, conducted a wide range of studies and concluded that “outdoor programs can result in significant physical, psychological, social, and educational benefits that sometimes affect participants for long periods of time in their ordinary lives” (as cited in Kellert, 2005, p. 17). Some of these benefits described by Ewert include enhanced self-esteem, self-confidence, personal effectiveness, improved coping skills, greater independence, and increased willingness to take risks. Activity also brings obvious health benefits of strength, endurance, and stamina that are increasingly important with rising concerns of obesity in America. In many situations, recreational activity involves working in teams. Ewert found in his studies that this can improve cooperation, the ability to work in teams, avoidance of conflict, respect for others, leadership, and capacity to make new friends; all of these things are important to a healthy unified community (Kellert, 2005, p. 16).

Thoughts

My design thesis will look to provide the healthy benefits of recreational activity by designing specific areas throughout the corridor. Riverfronts present a great opportunity for walking, running, and bicycling trails along with using the water for boating, canoeing, and other water recreational activities. It will be important to analyze specific locations along the Mississippi River where activity can be expanded upon.

Nature and Communities

Most of the research thus far has been conducted on individual people themselves, but how does environmental quality affect communities and neighborhoods? Many rivers connect communities along their route, and it is important to have a strong relationship between neighborhoods and the natural environment to provide a higher quality of life. Stephen Kellert (2005) and his colleagues conducted a large scale study that examined rural, suburban, and urban communities located within a single watershed. They found a strong correlation between environmental quality, people’s environmental values, and human physical and mental well-being in different urban and nonurban communities.

Within watersheds that had a high value of landscape features such as good road qualities, large attractive trees, open spaces, views of rivers, healthy streams, and other aesthetically pleasing land use variables, the people had a greater awareness and appreciation for their environment. Specifically, Kellert (2005) reported, “Communities with higher environmental quality had more positive environmental values and a higher quality of life, whereas those with lower environmental quality tended to reveal less environmental interest and a lower quality of life” (p. 44).

theoretical premise research

It is interesting to see in our highly developed urban age the way interaction with the natural environment can dictate and enhance human physical and mental well-being. This relationship can be further understood with three elements: ecosystem health, landscape features, and human environmental values (described in Figure 10).

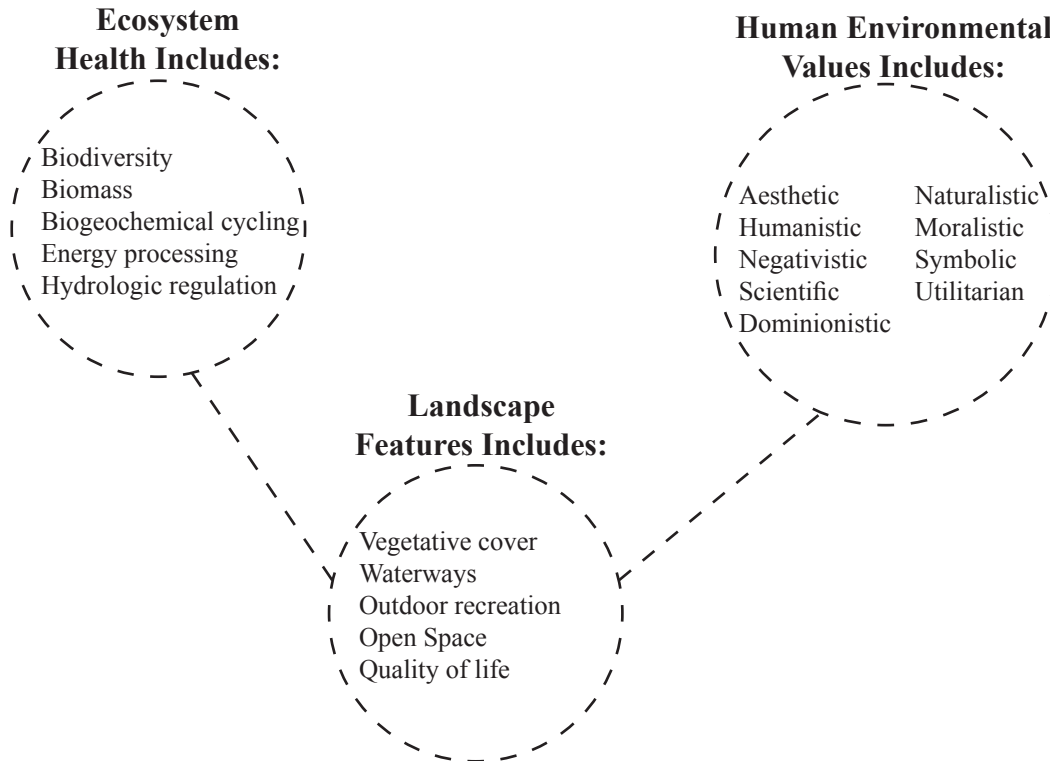


Figure 10. Hypothesized relationship between Ecosystem Health, Environment Values, and Landscape Features (Kellert, 2005, p. 46).

The factors listed in the diagram above occur in a “linked hierarchical fashion, with healthy ecosystems providing essential ecological services that foster the development of various biophilic values, which in turn encourage an attachment to and stewardship of these places where people work and reside” (Kellert, 2005, p. 46).

theoretical premise research

Importance of Landscape Architecture

Interaction between nature and a society can be greatly beneficial for human physical and mental well-being. Successfully incorporating theories of connecting human and natural systems together in an urban community depends on regenerative design strategies. Regenerative design goes beyond restorative and sustainable environmental design; it is a co-evolution between humans and nature. Kellert (2005) explains the goal of regenerative design as harmonizing nature with humanity. Two main objectives are to reduce adverse effects of modern design and development on natural systems and human health and to promote positive contact between people and nature in the built environment (Kellert, 2005).

The principles achieved through regenerative environmental design, further indicated in Figure 11, lead to building a sustainable, healthy, secure future, successfully resolving our modern day environmental predicament.

Theories Connecting Human Natural Systems

Design Strategies Linking Human & Natural Systems

Ecosystem Services	- - - - -	Low Impact Design
Biophilia	- - - - -	Organic Design
Sense of Place	- - - - -	Vernacular Design

Figure 11. Theory Connecting Human and Natural Systems with the Principles of Restorative Environmental Design (Kellert, 2005, p. 179).

Thoughts

My design thesis will look to use the Mississippi River as an amenity to the city of St. Cloud. Using regenerative design principles will enable St. Cloud's community to reconnect with its water and nature. The goal will be to strengthen neighborhoods using the river corridor and ultimately protect St. Cloud's economy and the future of its residents.

theoretical premise research

Restoring Streams in an Urbanizing World

Urbanization will continue to damage sensitive water ecosystems due to an increase of urban runoff entering river systems. These impacts will affect the hydrology and geomorphology of streams, resulting in detrimental alteration of the ecology in waterways. In order to combat this trend, river restoration has been an increasingly popular management strategy for improving physical and ecological conditions of degraded urban streams (Bernhardt & Palmer, 2007).

According to Palmer (2007), the goal of urban river restoration should be to restore the essence of the ecological structure and function, which characterize non-urban streams, and to reestablish the natural temporal and spatial variation in ecological attributes to stable conditions (p. 747). Findings from the National River Restoration Science Synthesis (NRRSS) indicate that restoration projects across the United States fall into four main categories: stormwater management, bank stabilization, channel reconfiguration and grade control, and riparian replanting and management.

Thoughts

It is pleasing to see that projects fall into one of the four main categories listed by NRRSS; however, not all projects incorporate improving vital biological communities or ecosystem functioning, which are important to a healthy river. My design thesis will focus on using an ecological solution that will go beyond the four main categories mentioned by NRRSS.

Further research will determine the most important management strategy for the Mississippi River at St. Cloud; however, using each of the four main principles will allow for the best design solutions for St. Cloud's riverfront.

Realizing The Importance of Rivers

After degrading urban rivers through years of abuse, it is encouraging to see that people have realized the economic and community value a river can bring. According to *Ecological Riverfront Design*, "Cities are rediscovering their rivers. For At least the past 30 years, cities and towns have been turning back to their rivers, transforming industrial and derelict land into new parks, residences, and commercial space" (Otto et al., 2004, p. v). This trend is continuing to rise for great reason; cities have a major opportunity to promote revitalization along riverfronts that will not only bring rivers back to health, but also the communities that depend on them.

theoretical premise research

However, restoring rivers will not be an easy task. Urban river health steadily declined through the first 70 years of the twentieth century due to “massive physical alterations of riverbanks, overharvesting of fish and other aquatic animals, and dumping of larger and larger volumes of sewage and industrial pollutants into rivers” (Otto et al., 2004, p. 12).

According to Schneider (1997), in the Clean Water Act of 1972, environmentalist demanded something to be done to protect the degraded rivers, and by 2000, the nation’s urban rivers and other water bodies became remarkably cleaner (as cited in Otto et al., 2004) This was a great sign but “despite significant progress in cleaning up point sources of water pollution, the Clean Water Act’s sweeping goal has not yet been achieved” (Otto et al., 2004, p. 13). Many species depend directly on wetland ecosystems, and with today’s streams, many species are threatened because of a river’s poor health. The Environmental Protection Agency (EPA) estimates 46% of threatened and endangered species rely directly or indirectly on wetlands for their survival (U.S. EPA, 1998).

Moving Forward

For communities to restore, revitalize, and/or enhance an urban river’s edge, it is important to incorporate strong ecological principles that take into account ecosystem services. “Restoring ecological systems such as riverbanks and stream buffers contributes to healthier environments and improves conditions for activities such as fishing, boating, swimming, and wildlife watching” (Otto et al., 2004, p. 31). Urban riverfront restoration is a complex process of in-depth analysis and research because each waterfront requires different strategies to account for site-specific problems. According to Schueler (2003), basic strategies must reflect the intensity of current development, the nature and intensity of planned development or redevelopment, the geometry and constraints of the riverfront, and the intended riverfront purposes and management (as cited in Otto et al., 2004).

Within these strategies are general principles to follow when attempting to reclaim urban waterfronts. These include but are not limited to ecological goals and economic development goals that are mutually beneficial, protection and restoration of natural river features and functions, regeneration of the riverfront as a human realm, compromises are necessary to achieve multiple objectives, and making the process of planning and designing riverfronts involve public participation (Otto et al., 2004). I will briefly touch the three I consider most important for my thesis development: ecological goals and economic development, protecting and restoring, and regenerating the riverfront.

theoretical premise research

1. Ecological Goals and Economic Development

It is important to understand that ecological and economical benefits go hand-in-hand when developing a successful waterfront. Defining a river's beauty is its natural appeal and healthy aquatic ecosystem supported by rich diversity. Development that brings people to the waterfront builds a connection and stewardship for the river. "Healthy, functioning rivers are appealing and attractive to residents and businesses" (Otto et al., 2004, p. 34). A good example of the way ecological and economical benefits come together is the South Platte River in Denver, elaborated further in case study research. A generation ago, the river functioned as a problematic urban ditch, but after the city improved it, it became one of Denver's most popular recreational areas.

2. Protecting and Restoring

Relating to the first principle, a river's habitat is rich in species diversity and is important to protect its natural features to support wildlife. Rivers provide vital natural benefits that must be protected to serve essential ecological functions. Restoring a river's health may be viewed as impossible; however, severe degradation can be overcome through time. According to *Ecological Riverfront Design*, small efforts have positive impacts, and improvements can be made along the most heavily impacted rivers. A good example is looking at the Anacostia River in Washington, D.C (Otto et al., 2004).



Figure 12. Anacostia Riverwalk Boardwalk

The Anacostia River had been viewed as dumping grounds for years but still offered rich wildlife. In 2000, plans were made to improve the river quality to swimming and fishing standards. The goal is to energize the waterfront by revitalizing neighborhoods, enhancing and protecting parks, improving water quality, and increasing access to waterfront destinations (Anacostia Waterfront Initiative, 2002).



Figure 13. Anacostia Riverwalk, the vision at night can light up the riverfront district.

theoretical premise research

3. Regenerating the Riverfront

Many urban riverfronts are challenged with physical, political, social, and economic tasks, but if successfully done, they can increase public enjoyment and create strong connections to communities. “Good riverfront designs consider the needs of all neighborhoods, ages, and cultures in the community” (Otto et al., 2004, p. 37).

Allowing the community to experience a river up-close promotes lively and diverse places while encouraging a connection to communities and an appreciation for nature. A good example of this is Hartford, Connecticut’s Riverfront Plaza; the city’s investments have brought much needed economic vitality to the city.



Figure 14. Mortensen Riverfront Plaza. This plaza is the centerpiece of the Riverfront Park System.

The city’s design consisted of building a plaza that connects downtown to the riverfront corridor, including terraces, trails, docks, and a park system. The success of the development was proven with over 850,000 visitors that accumulated \$17 million to the local economy (Riverfront Recapture, 2002).



Figure 15. Mortensen Riverfront Trail. Trees planted along the riverfront’s dike needed to be encased in concrete to prevent their roots from compromising the earthen structure.

theoretical premise research

Design Principles

Further research will determine my design strategies and goals; however, *Ecological Riverfront Design* (Otto et al., 2004) lays out principles for an ecologically sound riverfront design that I will be considering. These principles include preserving natural river features and functions; buffering sensitive natural areas; restoring riparian and in-stream habitats; using nonstructural alternatives to manage water resources; reducing hardscapes; managing stormwater on site using nonstructural approaches; balancing recreational and public access goals with river protection; and incorporating information about a river's natural resources and cultural history into the design of riverfronts features, public art, and interpretive signs. These principles are formed around a no-harm approach while emphasizing protection of the river's healthiest features. *Ecological Riverfront Design* considers its principles as some of the most effective techniques and best management practices. I will briefly cover the three strategies deemed most important to my thesis typology: managing stormwater on site; balancing recreation and public access; and incorporating information and cultural history.

1. Managing Stormwater on Site

It is essential to consider capturing, storing, and infiltrating stormwater before releasing it into the water for an ecologically sound urban riverfront. Poorly designed and engineered stormwater pipes and other structures only degrade a riverfront's edge. A natural water management approach can provide wildlife habitat and aesthetic value to an ecosystem. Natural management techniques include detention ponds, bioretention ponds and swales, cisterns, stormwater planters, and infiltration ponds. According to *Ecological Riverfront Design*, these "techniques can supplement infrastructure to cleanse and control stormwater, resulting in substantial savings for developers and local governments" (Otto et al., 2004, p.84).

2. Recreation and Public Access

A great way to bring people to an urban riverfront is by providing recreational opportunities. But how much recreation is enough? According to *Ecological Riverfront Design*, "Riverfront communities should provide facilities for as many recreational uses as possible while balancing some conflicting uses and managing possible overuse of the river corridor" (Otto et al., 2004, p. 87). Riverfront recreation includes canoeing, kayaking, rafting, fishing, boating, bicycling, riverwalks, etc., which provide revenue to the local community and increase human health. It is noted that recreational users are on the rise. According to the Outdoor Recreation Coalition of America, 34 million Americans over the age 16 went canoeing, rafting, or kayaking in 2001, and 71 million people went bicycling on riverfront trails and greenways. Economically, the EPA reported in 2000 that anglers spend 38 billion dollars on fishing every year. This is why it is important for cities to encourage recreation and for Americans to return to their urban riverfronts.

theoretical premise research

Another recreational opportunity for waterfronts is a water trail. A water trail is “a stretch of river, shoreline, or ocean that has been designated to provide educational, scenic, and challenging nature-based experiences to recreational boaters” (Otto et al., 2004, p. 91). Water trails are valuable for a healthy economy and can protect vital natural areas while providing a close experience with nature. People can become inspired by water trails, and they are a good opportunity for educational and classroom development.

When incorporating recreational uses to riverfronts, designers should combine river trails and greenways that provide riverfront enhancements and infrastructure. According to Smith and Hellmund (1993), properly designed greenways and river trails can protect floodplains and provide wildlife migration corridors between otherwise isolated “patches” of native habitat (as cited in Otto et al., 2004). They can also provide buffer zones for filtering stormwater and provide alternative transportation. Promoting alternative transportation can limit carbon emissions by connecting riverfront paths with businesses and homes. For example, a 60 mile greenways system in Boulder, Colorado, links neighborhoods to schools, jobs, and shopping. Even though only 12% of Boulder’s population commutes by bike, it is about 12 times the national average (Otto et al., 2004).

Greenways usually include riverfront parks. These areas are important because if properly designed, they can minimize or mitigate stormwater effects on the natural environment. It is critical to build greenways to work with sensitive areas like wetlands, meadows, or eroded banks so users don’t have a negative impact on them (Otto et al., 2004). A greenway can also incorporate pedestrian bridges that allow for movement around privately owned land while permitting an intimate and closer connection to the water. A successful riverway trail system may increase public support for river protection, tributary restoration, and trails while encouraging a social connection between communities (Otto et al., 2004).

Thoughts

It is evident that the Mississippi River corridor in St. Cloud has public land that I will have to strategize a greenway system around. Further analysis must determine locations where trail systems can be connected. The use of pedestrian bridges and infrastructure may be an essential part in developing a strong connection throughout the river corridor and in promoting recreational activity.

theoretical premise research

3. Information and Cultural History

Rivers have rich history in the United States. However, many natural systems' histories have been forgotten or lost through the years. The local public may not know about their river's history or function and if they don't know about it, it's unlikely tourists will know either. "An informed public that understands river ecology as well as the potential for regeneration will support efforts to improve and protect its river" (Otto et al., 2004, p. 91). Education and signage promote an opportunity to bring out rich history, and in doing so, they can also provide information on water quality issues and boat navigation. This concept should explain a river's unique characteristics and natural assets (Otto et al., 2004). Ways this can be included are through interpretive signs, public art and special events, and interpretive programs. This is a good way to bring people of all ages, ethnic backgrounds, and social classes together to experience interpretations and activities. Education encourages people to explore the riverfront and connect with nature while enhancing the city's economic and cultural vitality.

Thoughts

Looking further into St. Cloud's history and the Mississippi River will allow me to pull forgotten local cultural elements. When exploring St. Cloud's past, it will be important to look for certain characteristics that I can develop throughout my design proposal. This will allow me to create a consistent theme of informational kiosks, art displays, and other informative programs for the community to reconnect with.

summary of research

Digging deep into a city's history, one can discover missing elements that may reconnect a city to its forgotten culture, ancestors, and/or vital waters. Revealing an urban riverfront's pattern through time is important for planners in order to understand land use and development, which can influence the city's future expansion. Further research will determine St. Cloud's historical past and development around the Mississippi River. Finding a broken link in its past will be important to expose through the design proposal phase in order to promote a strong social and cultural connection within St. Cloud.

Population is on the rise; Bernhardt and Palmer (2007) believe by 2030, 85% of North American populations will be living in urban areas. With population growth, urban riverfronts design becomes an important element in protecting natural waters and habitats. To prevent further environmental degradation, an urban river corridor is a great area to protect the natural environment from water pollution and waste while connecting people to their natural waters.

Humans have an unconscious tendency to involve nature in their daily lives with the forms, patterns, and language of everyday life. Studies have shown that interaction with nature can enhance human physical, mental, and spiritual well-being. However, contemporary society fails to promote healthy and diverse natural systems in urban environments.

Riverfront corridors, like the Mississippi River in St. Cloud, can use green spaces and natural areas for stress relief and improving emotional well-being and intellectual functioning. Studies by Terry Hartig (2005) and colleagues have proven greater emotional gains from people who walk through parks and who have the availability of green fabric within their city (as cited in Kellert, 2005).

Within river corridors are opportunities for recreational activity; Stephen Kellert's (2005) research has suggested that activity can exert significant effects on participants. Additionally, recreational activity usually consists of working in teams, which can improve cooperation, leadership and teamwork skills, conflict avoidance, and respect for others.

St. Cloud's Mississippi River connects neighborhoods along its route, however, these communities are currently lacking a strong relationship to their natural environment. Kellert (2005) has found a strong correlation between people's environmental values and quality, which is beneficial to human physical and mental health within urban communities.

summary of research

Many human benefits can come about through natural environments when implementing regenerative design principles. The main goal of regenerative design is for humans and nature to coexist by creating systems within the natural environment. Conventional design has mainly consisted of building human environments around natural areas instead of within nature.

When dealing with urban riverfronts, it's important to use strong ecological principles that restore, revitalize, and enhance a river's edge. Using these principles successfully through an ecological solution can increase public enjoyment and create a powerful connection to the city and the environment while benefiting the city socially, economically, and culturally.

the future of st. cloud

The City of St. Cloud recognizes its need to plan for future expansion and to set a vision for the community. In 2003, the city produced a plan (St. Cloud Comprehensive Plan) to set forth basic guiding principles of land use and public improvements, which have been embraced by the city, to shape its future. The comprehensive plan has been developed by the Planning and Zoning Department with public input to shape its vision for a more livable and sustainable city (St. Cloud Comprehensive Plan, 2003).

Elements of St. Cloud's vision calls for the city to be a place:

- Where natural resources are preserved
- That recognizes the importance of the Mississippi and Sauk Rivers
- Where development is compatible with the environment
- With economic opportunity
- With a strong, diverse, and growing downtown
- That is aesthetically pleasing
- Of quality neighborhoods
- Of recreational opportunities
- Accepting of diverse populations and opinions
- Where an effective public/private transportation system is available

The St. Cloud Comprehensive Plan states the results of a survey done by the city that asked participants a variety of questions about their city. I will briefly cover a few issues and results I deemed most important to my thesis.

Question: What are the city's strengths, opportunities, and positive community attributes? (most concerning to least concerning)

- Rivers
- Parks and trails have a good start
- Historic resources
- Downtown arts and paramount
- Good neighbors

Question: What are the city's weaknesses, threats, and negative attributes? (most concerning to least concerning)

- Traffic problems/roads and bridges in decline
- Lack of access to Mississippi
- Ugly signage
- Attitude/resistance toward cultural diversity
- Lack of bike routes
- Sprawl

the future of st. cloud

My design thesis will look at excelling the strengths of the city while improving its weaknesses. St. Cloud's community is concerned with the poorly designed current conditions that don't rectify the city's positive attributes. Using ecological and regenerative principles as an ecological solution, these issues can be refined and strengthened to enhance the quality of St. Cloud.

According to the St. Cloud Comprehensive Plan, the city is expected to have considerable growth over the next 20 years, mainly in urban areas (Comprehensive Plan, 2003). The Mississippi Riverfront may be a key element for the future success of St. Cloud.

case study #1

Above The Falls

Location | Upper Mississippi River, Minneapolis, Minnesota

Involvement | Lead by BRW, Inc. (A Dames & Moore Group Company)
Others: Robbin B. Sotir & Associates, Inc., Anton & Associates, Inc., and McComb Group, Ltd.

Scale | 90 acres of park, 15 miles of bike lanes and recreational trails, 4 miles restored riverbank, 5.25 miles of parkway and boulevard, 2,500 housing units

Completion | Implementations for first phase began in 2009

Objectives

- Provide public access to river.
- Create a system of riverway streets.
- Enhance the ecological function of river corridor.
- Link upper river to Grand Rounds parkway system.
- Realize the area's potential for economic development.
- Establish urban design guidelines.

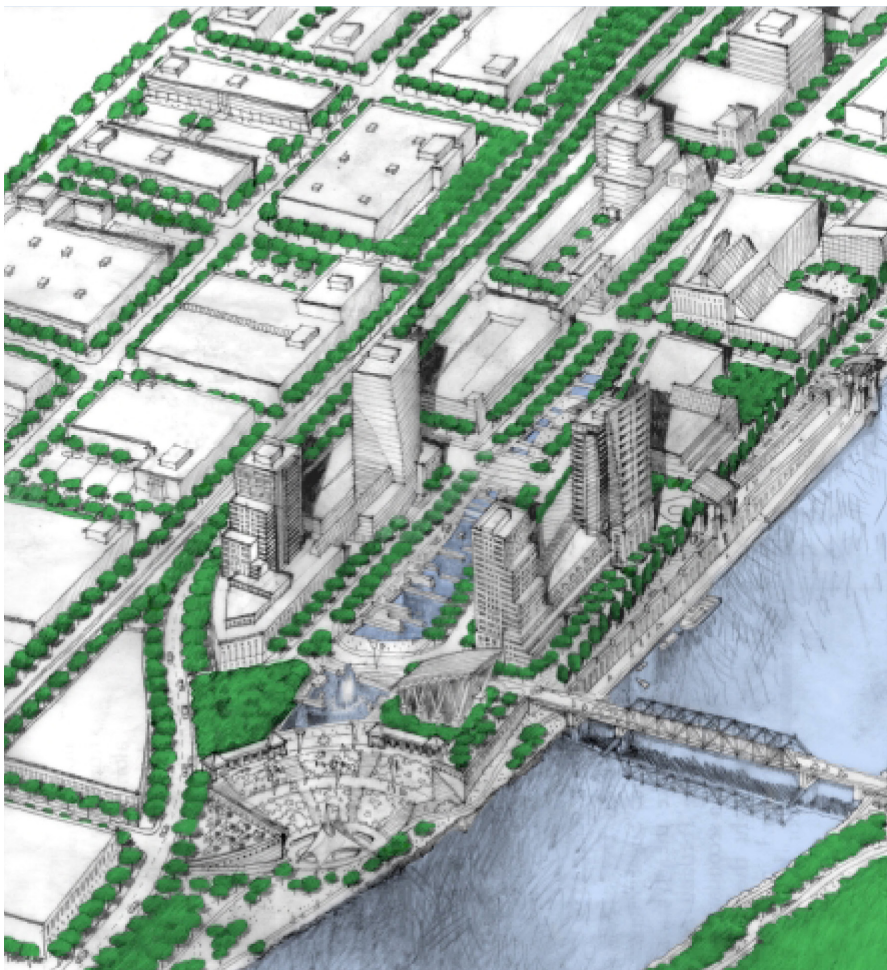


Figure 16. ATF, 1999. River City located south of 26th Ave. Takes advantage of great views of the river and downtown with high-rises and mixed-use buildings. Goal is to create a vibrant urban environment.

case study #1

Above The Falls (ATF) is a preferred plan that the city of Minneapolis has taken on and includes features such as a new neighborhood on the west bank, a pedestrian promenade along the river, the West River Parkway that acts as buffer between uses, opportunities for entertainment and hospitality destinations, mixed-use and higher-intensity development, a BN bridge converted into a pedestrian and bicycle facility, and rail use.

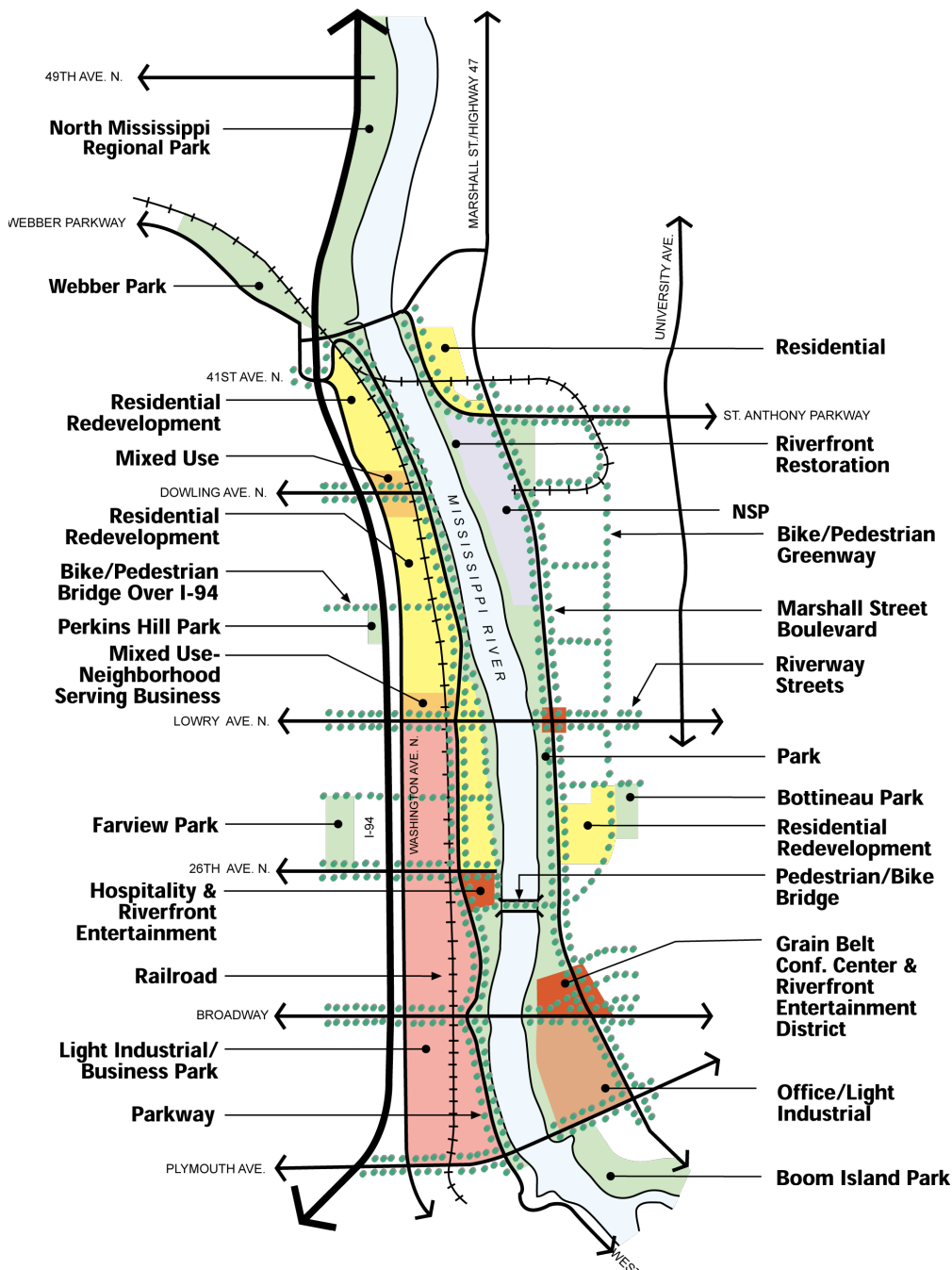


Figure 17. ATF, 1999. The preferred plan.

case study #1

Overview

ATF is a bold vision for developing the Mississippi Riverfront into a regional park amenity for north and northeast Minneapolis (ATF, 1999). Building a strong connection between the central waterfront and the northern corridor will provide multiple benefits for Minneapolis. ATF recognizes the need to replace heavy industrial industries along the river that pose land-use conflicts. The surrounding neighborhoods have blocked views and access to the poorly developed waterfront. When people do make it to the water's edge, one can see an environmentally degraded riverfront, unpleasing to the eye. This has caused a lack of demand to use and be part of the urban waterfront. However, according to BRW Inc., the opportunity is clear and simple: "There is only one Mississippi, and the Upper River is the best potential large-scale amenity awaiting development in the city of Minneapolis."

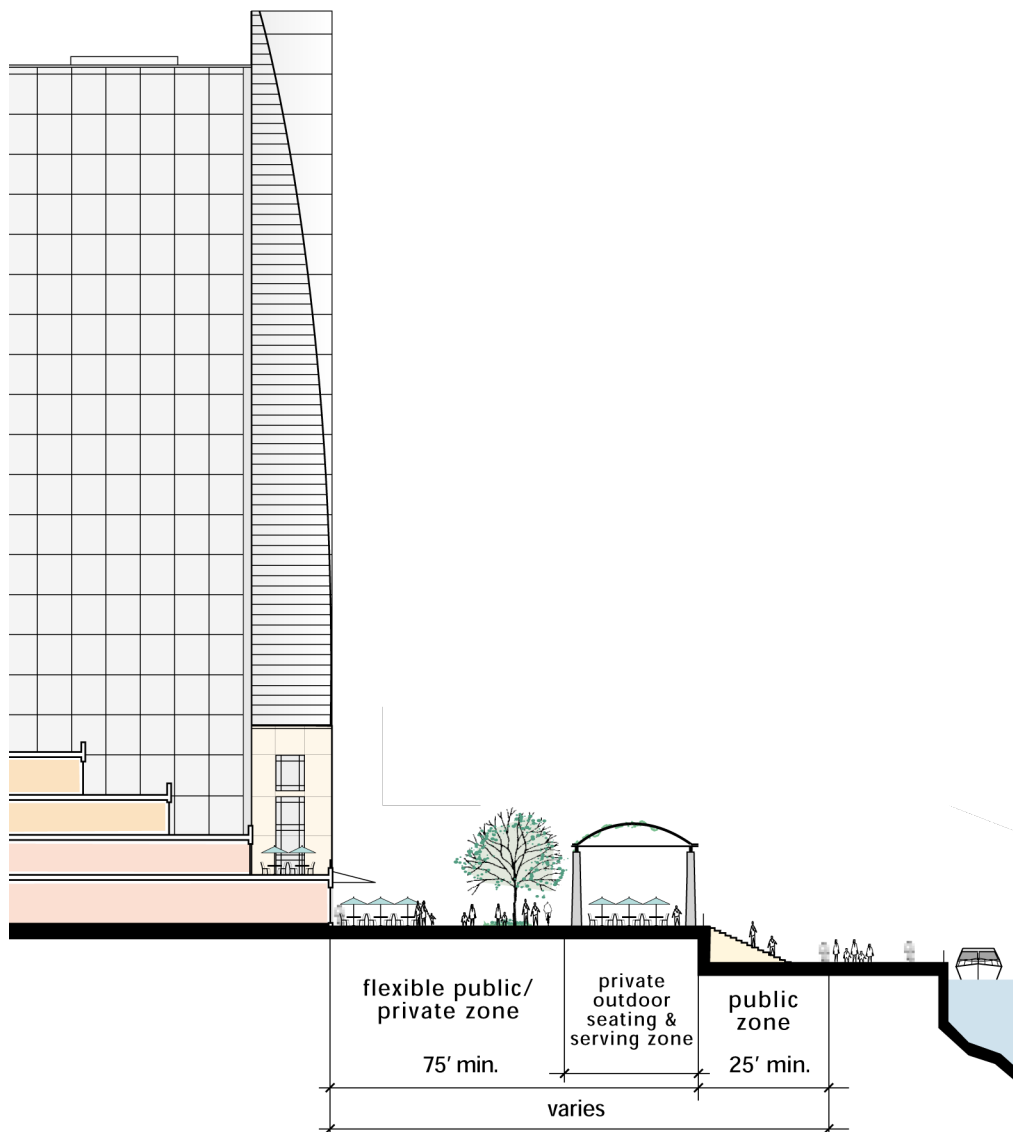


Figure 18. ATF, 1999. River City, located south of 26th Ave. This area offers residential high-rises, parkway, water filtration park, and a riverfront promenade.

case study #1

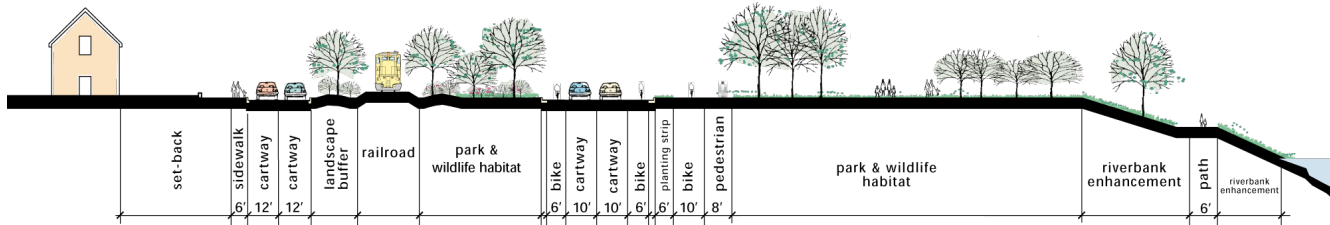


Figure 19. ATF, 1999. West River Parkway North of Dowling Ave.

The ATF Proposed Plan:

- Proposes that the highest and best use of the Upper River area has yet to be developed
- Recognizes the future economic development value of riverfront amenities
- Helps to stabilize communities in north and northeast Minneapolis
- Meets Metropolitan Council goals for growth within established urban areas

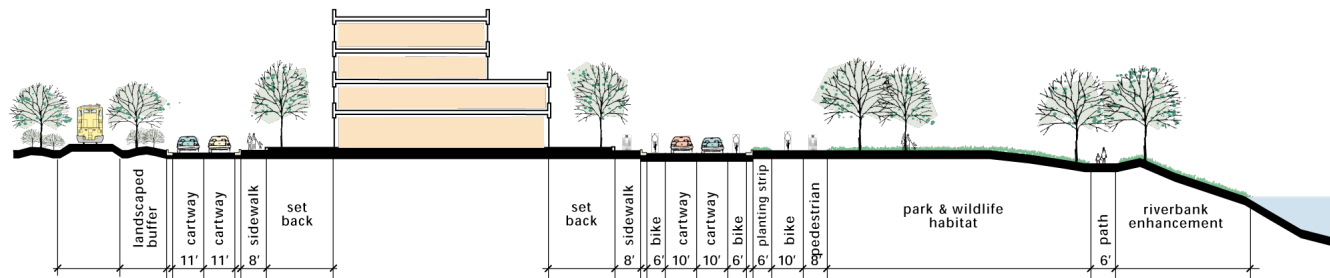


Figure 20. ATF, 1999. West River Parkway South of Dowling Ave.

According to the Minneapolis Park & Recreation Board, in the last decade, the ATF project has “captured the attention of a citizenry anxious to reconnect to the world-reowned river that has so influenced the city’s history.” The plan has successfully created a vision for the banks of the Mississippi River in Minneapolis. Its vision will allow for residents to enjoy the urban waterfront with recreation and social development. By providing locations for lively riverfront entertainment and hospitality sites, it will take full advantage of looking at the river as an amenity to the city rather than only a resource.

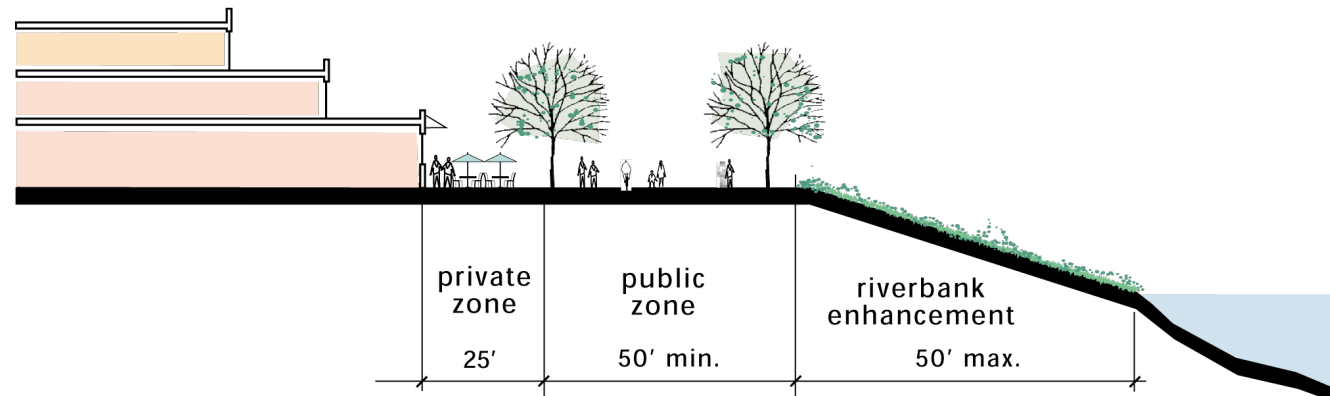


Figure 21. ATF, 1999. 26th Ave. meets the Mississippi River.

case study #1

Continuing Development

Improvements and enhancements are still being made to the original *Above The Falls* plan. In 2005, the Minneapolis Park and Recreation Board completed a schematic plan to create new recreational trail systems that connect to existing trails. In this plan, other amenities will include improved access to the river, lighting and signage, plazas and gateways, stormwater management, and riverbank stabilization (Minneapolis Park and Recreation Board, 2006).



Figure 22. ATF, 2006. Orvin “Ole” Olson Park, located towards the north end of project area. Vision for the park is to be the southern terminus for intensely redeveloped mixed-use

case study #1



Figure 23. ATF, 2006. 17th Ave. N. Terminus. This area will be used to strengthen the connection to the river by enhancing the streetscape and planting trees closely together to create a green tunnel.

The first phase of construction for this plan, West Bank, focuses on recreational and environmental improvements that can be made within existing land uses and ownership. This area will give the greatest immediate impact and will be unaffected by future construction. The four main focus areas will include bike and pedestrian rim trails, treatment of stormwater run-off, streambank stabilization, and Bur Oak plantings along the riverfront corridor.

The project area is a critical link in completing the chain of green space throughout the City of Minneapolis (ATF, 2006). ATF-Phase One West Bank will provide the crucial public access to the Mississippi River for water recreationalist and have aesthetically pleasing views of the downtown skyline.



Figure 24. ATF, 2006. The Garden and Overlook at 22n Ave. N. Rain gardens will be used to treat stormwater runoff, stable slope, and remove sediments.

case study #1

Continuing development will look to carry out the industrial history of the local city to link it to existing downstream interventions. The West Bank area land use is predominantly heavy industry; however, mixed-used redevelopment has begun occurring along the riverfront.

Conclusion

This case study is a good example of how a design intervention is taking place along the Mississippi River in the similar climate of my proposed project area, St. Cloud. The Above The Falls plan shows the importance of bringing the inter city out to experience the urban waterfront. The way this plan has phased out its design interventions is a strategy I may use when developing my design proposal.

case study #2

Paseo Del Rio (Riverwalk)

Location | San Antonio, Texas

Involvement | Conceptual idea lead by Robert H. H. Hugman

Scale | 17,000 ft new sidewalks, 31 stairways, 3 dams, 4,000 trees, shrubs, and plants

Completion | March 13th, 1941 first opened to public

History

The San Antonio River has a rich historical background. The “city was founded in 1691 as a Spanish mission near a cluster of springs that fed the San Antonio River” (Black, 1979, p. 33). It has been used by Native Americans, Franciscan missionaries, and other explorers as a mode of transportation, a source of sustenance, and as a spiritual element, giving reason to encourage settlement (Hammat, 2002). The history of the river has played and continues to play a major role in the development of communities in San Antonio.



Figure 25. San Antonio River, 1800s. This image helped illustrate the river as a “street” to show the importance the river held for early transportation.

In September of 1921, a major flood caused 50 lives lost and \$50 million in damage, primarily in the downtown area (Black, 1979). A strategy needed to be developed to protect the city from flooding. In 1929, Robert Hugman began imagining a riverfront corridor that resembled cities in Spain with small streets and nice shops and restaurants. Hugman began to express his interest in the river in a way architects know best: by preparing an elaborate set of drawings and maps. Hugman suggested a flood cutoff channel or bypass with gates to the entrance and exit of the big bend to protect it from high waters, freeing the area from potential flooding and allowing it to become a linear park (Black, 1979).

case study #2

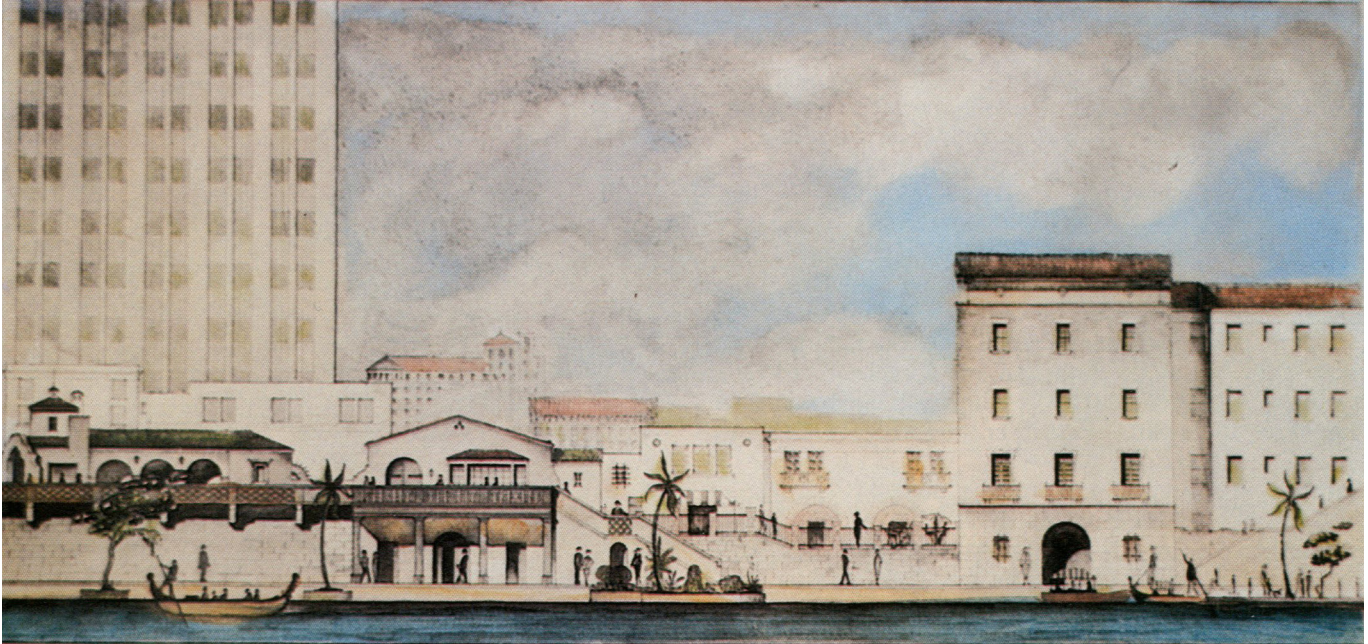


Figure 26. San Antonio River Walk. Robert Hugman's early visions of the river's development.

Hugman's plan enthused C.M. Chambers (the mayor at the time). Then the plan began being presented to civic and community leaders, stressing the great commercial opportunity and benefits it would bring (Eckardt, n.d).

According to Gregg Eckardt, an estimated 50,000 people waited in line for the River Walks grand opening. At first, the community didn't take to the design too well because of criminal activity, resulting in the downtown area turning its back on the river. It wasn't until 1962 when the establishment of the River Walk District and Advisory Commission that San Antonio's River Walk reached its full potential (Eckardt, n.d).



Figure 27. San Antonio River Walk at Casa Rio, 1946.

case study #2

1950s - 1960s: Enhancing The Original Design

As suburban sprawl began being promoted across the U.S. in the late 1950s, the San Antonio Chamber of Commerce began organizing a strategy to bring life back into the city center. “It is to the credit of the San Antonio Chamber that it produced a man like David Strauss, who could see the river’s potential as the catalyst for downtown revitalization” (Black, 1979, p. 36).

The committee wanted to preserve and promote the natural beauty and distinctively quaint and romantic character of the river walk area while integrating shopping, entertainment, and recreational areas. This would result in economic benefits for the city and maintaining the urban center of San Antonio as a leading attraction for tourists (Black, 1979).



Figure 28. San Antonio River Walk, 1979



Figure 29. San Antonio River Walk, 1979

Cyrus Wagner (AIA committee member) sparked attention in the same way Hugman did in 1929. He used inspirational drawings that imprinted an image into the minds of San Antonio’s leaders in 1964. These upgrades were developed and built between the years of 1964 and 1968 (Black, 1979).

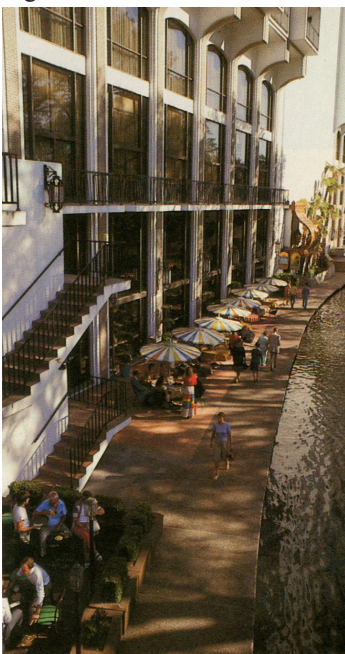
case study #2

1970s: Experiencing The River Walk

The River Walk became more and more popular to both the tourist and the citizens. “The San Antonio River is the downtown area’s major amenity and is currently recognized as its most powerful catalyst for redevelopment” (Black, 1979, p. 30). According to Sinclair Black (1979), strolling through the area is like a “linear paradise of infinitely changing vistas” (p. 30). The River Walk is made up of impressive displays of texture and color from the plant material, continuously entertaining movement of the water, the varied patterns of the walkway underfoot, buildings, shops, restaurants, and many people (Black, 1979).



Figure 30. San Antonio River Walk, 1979



Even when a building is put up on the river that is out of scale because of its size, (for example, the Hilton), the beauty and power of the river still controls and defines the space. When one is proposing a building to be built along a river corridor, according to Black (1979), “the most appropriate solution is probably a quiet building which simply responds to the space defined by the river” (Black, 1979, p. 36).

Figure 31. San Antonio River Walk, 1979. The Hilton.

case study #2

1970s: Impact of the River Walk

In 1973, a study by Skidmore, Owings, and Merrill of San Francisco conducted a deep analysis of the San Antonio River within the city's limits. The study found the river to be a pedestrian link between downtown and 1,000 acres of open space, two colleges, two museums, the major city bank, numerous older neighborhoods, and the metropolitan zoo. These areas also served as a link to the major historical site of the King William District (Black, 1979).

The San Antonio River Walk was an economical powerhouse. Recorded in 1978, a total of 488 conventions (more than one per a day) and contributed over \$34 million to the San Antonio economy (Black, 1979).

A reason why the River Walk is so great is because it can be experienced in six separate trips, and in each trip you may reveal something different than you did the first time. Black (1979) explains the different ways one can experience the site are by walking on each side of the corridor in both north and south directions (equaling 4 different views) and by riding a river boat each direction (equaling 2 different views).



Figure 32. San Antonio River Walk, 1979

Another major success of the San Antonio River is the “cooperation between the public and the private sectors; small-scale, incremental work and careful attention to physical as well as historic and cultural fabric of the area” (Black, 1979, p. 39).

case study #2

Thoughts on The River Walk (1940 - 1970)

San Antonio's River Walk is aesthetically pleasing because of all the different views one can perceive in the area. This is something I can carry throughout my design proposal of the Mississippi River corridor. It will be important to think about how each day can be experienced differently. This can be done by using techniques of lighting and materials to create a sense of place while incorporating the effects of each season.

Another method used by the leaders of San Antonio during the design process was using the local community. A strong sense of place is felt within the River Walk today because of a strategy of only employing local people, using only local materials, and responding to the sensibility of local culture and history.



Figure 33. San Antonio River Walk, 1979

case study #2

1980's River Walk

In 1988, an addition to the San Antonio River Walk was created to be a grand entrance to the Rivercenter retail-and-hotel complex and was linked to the earlier 1968 extensions (mentioned previously). The new expansion was designed by San Antonio's firm of Ford, Powell & Carson Architects & Planners, Inc. They built off Hugman's vision and designed a "living room" that created an unique space to be "imposing and intimate, secluded and lively, varied and coherent, functional and fun" (Greenberg, 1991, p. 32).

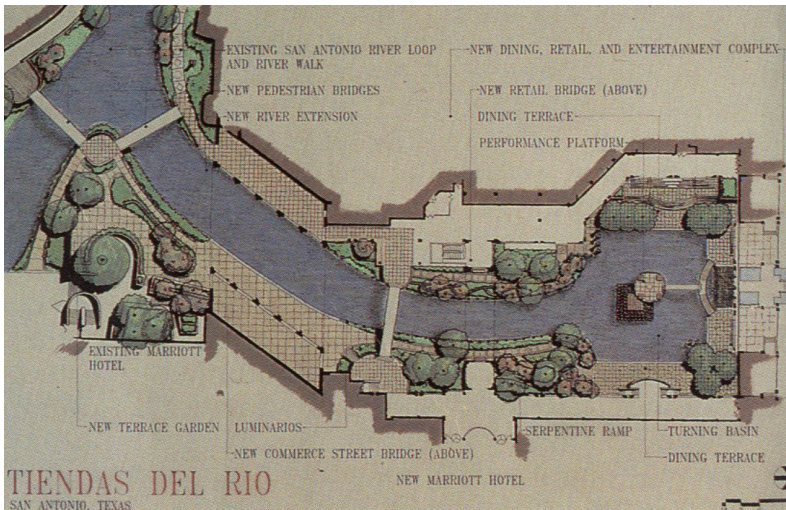


Figure 34. San Antonio River Walk. Grand Plaza. Master Plan

According to Ken Greenberg (1991), the Grand Plaza is most memorable for its sense of arrival as either a river-level pedestrian or as passenger of a barge. Approaching the Rivercenter through unique spaces of low and shady areas to vast and sunny areas creates a memorable experience.



Figure 35. San Antonio River Walk. Grand Plaza, 1991.

case study #2

1990's River Walk

In the early 1990s, San Antonio began looking to extend its attracting urban riverfront to the local community. “With an emphasis on restoration and community interaction, landscape architects plan to extend the success of the San Antonio river walk” (Hammatt, 2002, p. 73). Lead by the SWA Group of Houston, a 13 mile extension north and south of the existing river is planned to create new connections and community interaction with the river. According to Heather Hammat (2002) of the Landscape Architecture Journal, the proposal won the ASLA Honor Award for Analysis and Planning in 2001. The new plan focuses on nature, people, and hydrology with an overall goal to improve the health of surrounding environments and to provide access to the river using the riverfront as a community amenity.

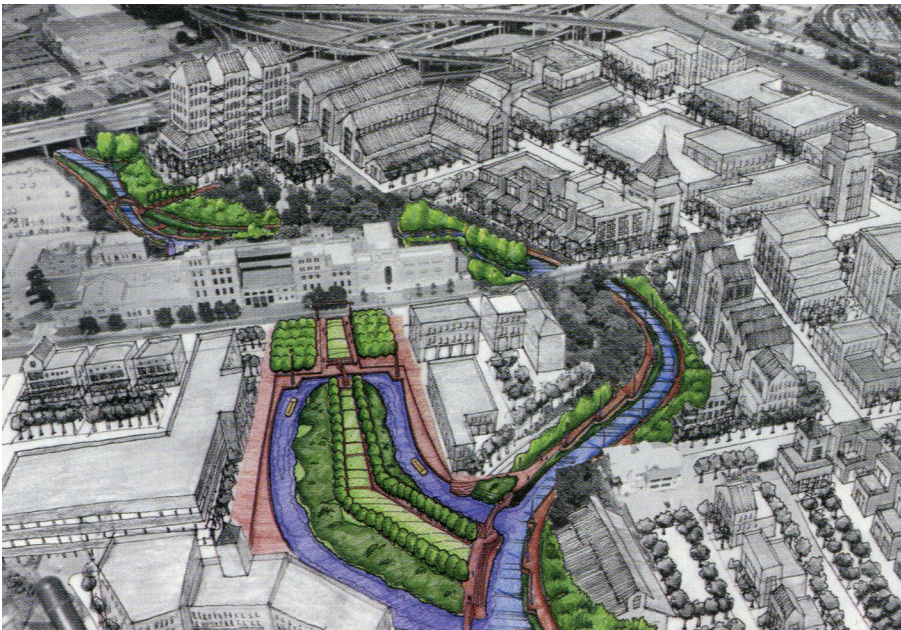


Figure 36. San Antonio River Walk. North Reach Perspective. The new design will restore a more natural habitat into this narrow urban corridor.

Community leaders wanted to extend the River Walk beyond tourism and the inner city to focusing on the community as a whole and revitalization of potential vulnerable areas. It sought to create habitats and places for people to use and enjoy while enhancing the quality of life. Each area of focus, the North and the South Reach, have different characteristics and problems associated with them (Hammatt, 2002).

case study #2

North Reach

Existing Conditions: High density urban area, steep sloping river banks, narrow river areas, 80 foot wide right-of-way, and private properties including the San Antonio Art Museum and the University of the Incarnate Word.

Goal: Restore natural habitat while creating pedestrian and bicycle access.

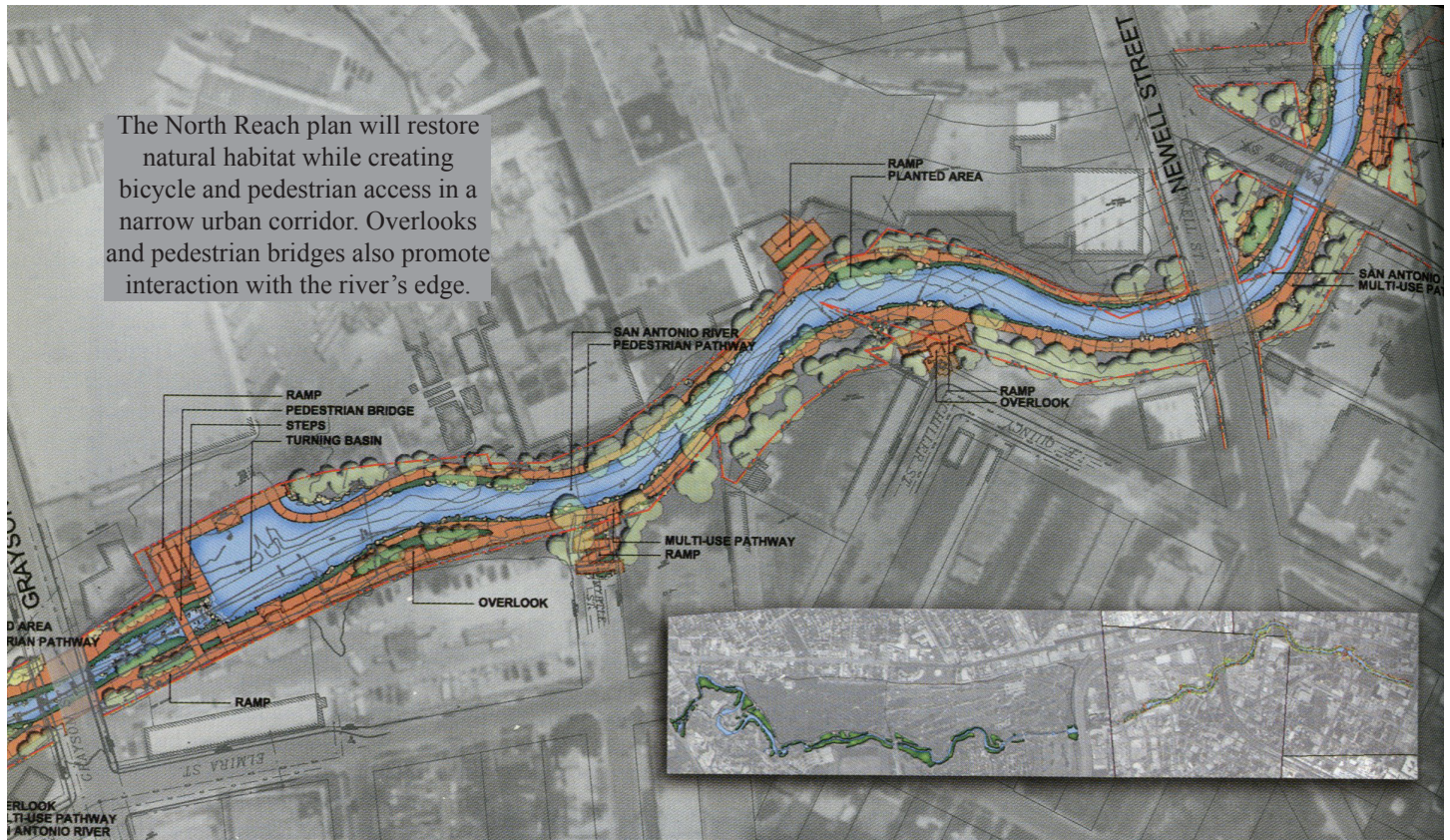


Figure 37. San Antonio River Walk. North Reach Plan.

Strategy: Damming the North reach at Brooklyn Avenue while creating planted crib walls in place of standard retaining walls will gain the width of the steep slopes and allow introduced vegetation. Also, the river bottom will be lined with cobblestones, becoming a food source for fish and creating a healthier habitat. Figure 38 is an example of an area the SWA Group are proposing, Brooklyn Avenue Dam (Hammatt, 2002).

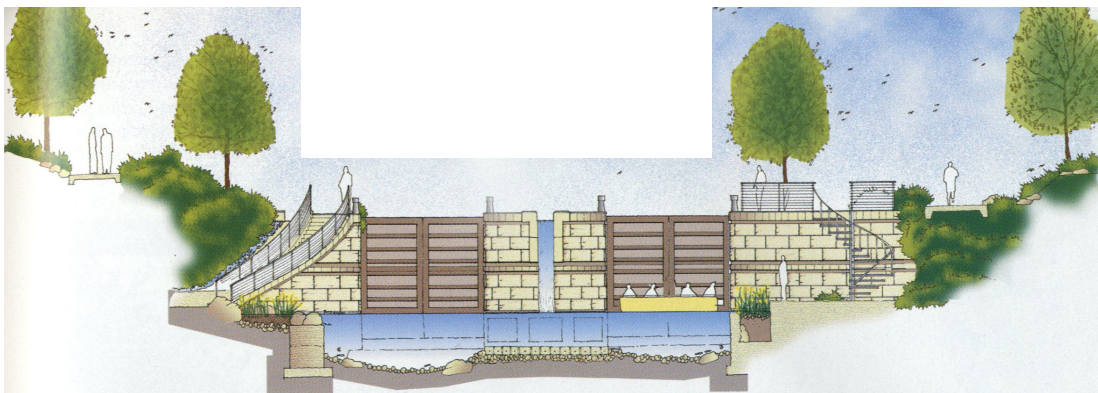


Figure 38. San Antonio River Walk. North Reach at Brooklyn Avenue. Damming the North Reach will enable passenger barges from the existing river walk to navigate farther north. Bottom, planted crib walls allow for vegetation and bank stabilization while cobblestones line the river bottom, promoting the growth of organisms and a healthier river ecosystem.

case study #2

South Reach

Existing Conditions: Suburban area with rural and agricultural landscapes, erosion, concrete riprap that causes the river to flow in a linear path, and property owned by the city, county, and the National Park Service.

Goal: Recreating the flow of the river to a naturally flowing pattern by using principles of geomorphology and grade control, incorporating water recreationalists, and connecting adjacent mission properties.

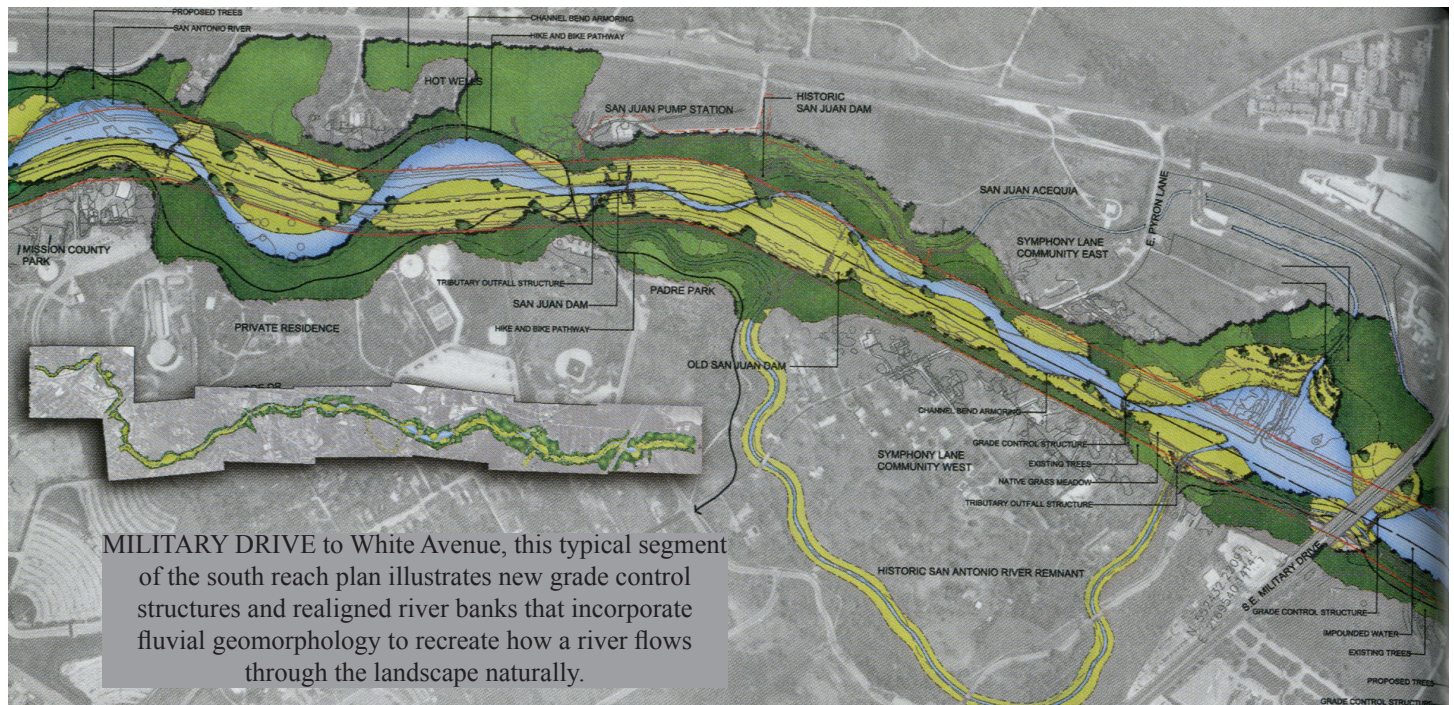
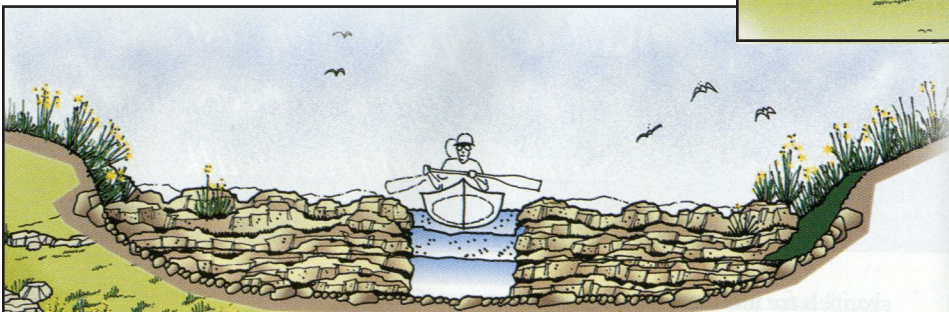
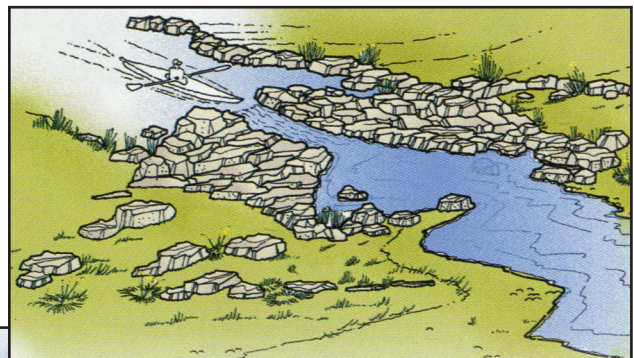


Figure 39. San Antonio River Walk. South Reach Plan.

Strategy: Restoring the river's natural meandering path wherever possible and creating slopes that are laid back at a gradual angle. Also, using small weirs throughout the south reach to provide grade control and improve water quality with the use of indigenous limestone. Figure 40 is an example of the proposed small weir.

Figure 40. San Antonio River Walk. South Reach Plan. Grade Control Structures, in the form of indigenous limestone weirs, span the south reach, controlling water flow so that it does not scour and erode the bottom of the river. The weirs are designed to allow passage through a narrow opening, a nod to local canoe enthusiasts.



case study #2

Currently

According to the San Antonio River Improvements Project, phases of improvements have already been opened to the public. Only the North Reach, also known as the Mission Reach, has yet to be completed; its final phase is scheduled to be completed by the end of 2013 (San Antonio River Improvements Project, 2012).



Figure 41. San Antonio River Walk, 2010

Thoughts

The San Antonio River Walk is known across the United States for good reason. The River Walk's history is a great story in itself, and when one passes through the site, it is felt. It proves to be an economical and ecological success to the city and a great example of how a landscape architecture, holistic design approach, can be much better than an engineering, now approach.

A couple areas that will be carried into my design thesis are the ways the San Antonio River connects neighborhoods along its route and the river is used for recreational purposes. Over 10 miles of walking and biking trails and water recreation have been proven to be successful as a great amenity to the city.

case study #3

South Platte Riverfront

Location | Denver, Colorado

Involvement | Design Workshop, Wenk and Associates, Norris Dullea, Architerra Design Group, Civitas Inc.

Scale | 10.5 Mile Green Network System

Completion | Commons Park, 2001; Cuernavaca Park, 2003; Centennial Gardens, 2002.

Overview

The city of Denver wanted to improve the health of the South Platte Riverfront along a 10.5 mile stretch in the 1970s. A campaign was launched to develop a systematic greenway of parks along the river that would include Commons Park, Cuernavaca Park, Confluence Park, and Centennial Gardens. The overall goal of the Denver Comprehensive Plan was to change the South Platte River into uniting neighborhoods on the east and west sides.

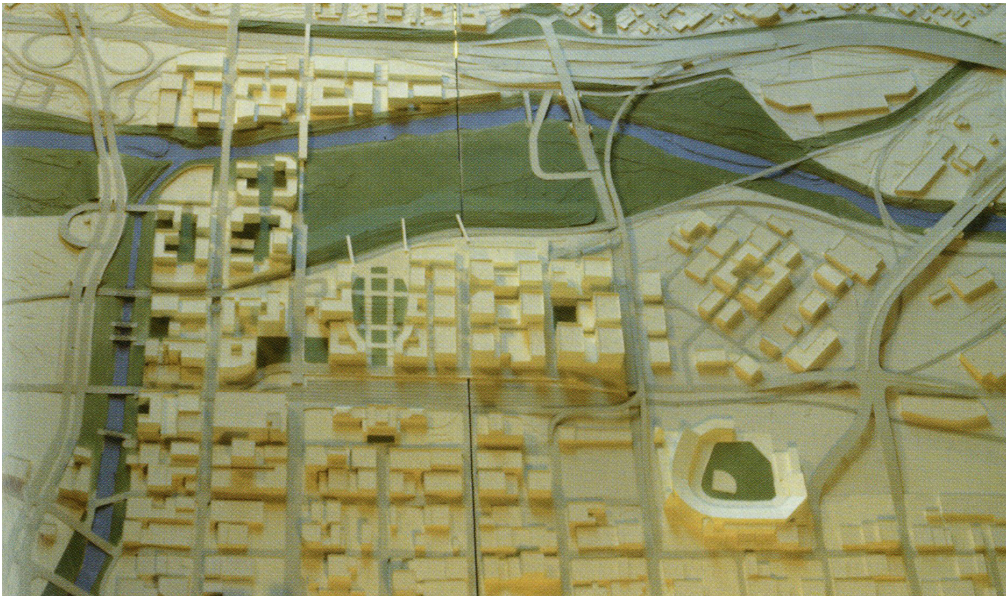


Figure 42. South Platte Riverfront. Model by Civitas Inc.

South Platte River

At the heart of Denver's birth place, where Cherry Creek and the South Platte River meets, use to lie a brown field left from industrial dump sites, railroad tracks, and "dirty" manufacturing. The city needed to reclaim its origin along the river. Ken Salazar, attorney and former director of the state's Department of Natural Resources, saw this as an environmental opportunity (Chandler, 2002).

case study #3

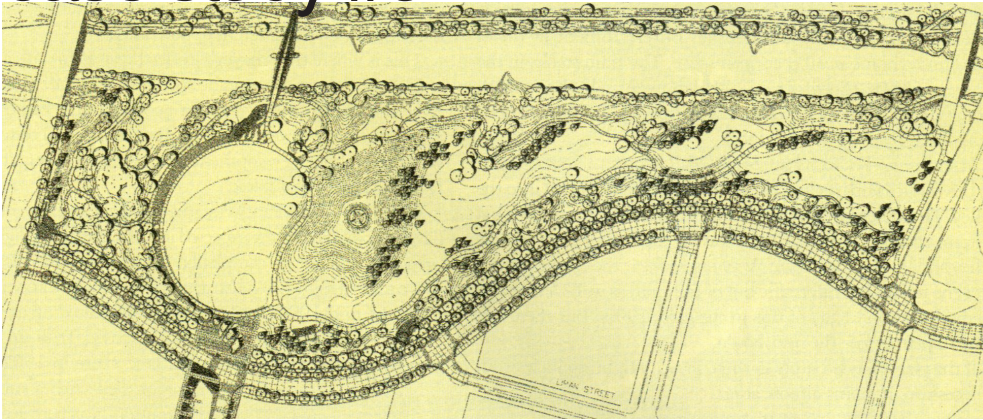


Figure 43. South Platte Riverfront, Commons Park. Plan done by Civitas, Inc. shows zones of more natural landscape along the river and a linear sweep of lawn at the center.

A legacy was born in the dreams of the 1970s and later was captured in another administration's plans (Chandler, 2002). It started with Confluence Park where head of Platte River Development Committee, Joe Shoemaker (former state senator), was intent on creating an area for residents to enjoy a park reach by either foot or water. Confluence Park opened in 1976 with trails, rocky waterfalls, and facilities for kayakers, as well as hardscape elements such as a plaza (Chandler, 2002). This foundation began a continuing effort to promote growth of the riverfront park system. The river and park began to work together as cities were turning to their rivers for "rejuvenation as well commerce" (Chandler, 2002).



Figure 44. South Platte Riverfront, Commons Park. Rendering done by Design Workshop promotes a concept of a built-out Valley.

Commons Park, designed by Civitas and completed in 1999, became the major link for parks along the riverfront. It is Denver's first major city park built in 50 years, featuring 20 acres of open green space, numerous trails, park benches, a stone amphitheater/seating area, a sun garden (mound), and artwork. Local residents stated their input for the new park (Commons Park); they wanted a new park to not consist of hard edges and be without soft infrastructure because Confluence Park was already created that way. Commons Park was created into a green passive space for recreation and reflection.

case study #3

Commons Park started an evolution of parks, paving the way for multiple new green spaces and habitats built alongside the South Platte River. The 10 and a half mile river corridor contains Commons Park, Confluence Park (updated in 2002), Cuernavaca Park (updated in 2003), Centennial Gardens (2002), and Denver Skate Park (2001). Each project area “accommodates different uses and offers different amenities and design elements” (Chandler, 2002, p. 90).

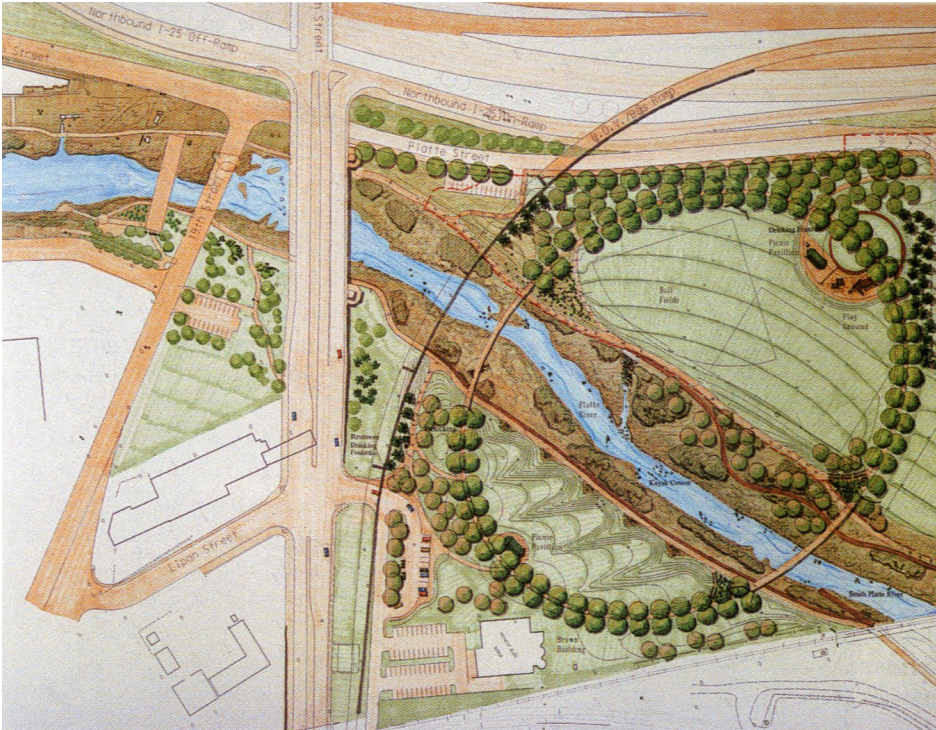


Figure 45. South Platte Riverfront, Cuernavaca Park.

Currently

According to the *New Urban Network*, today, on any given day at Central Platte Valley, one would see people walking or biking to work on the trails, playing in the riverfront parks, and enjoying the views from the cafés and plazas associated with new high-density mixed-use buildings. The major park that links the riverfront together is Commons Park, which creates a strong connection to the citizens and the South Platte River.



Figure 46. South Platte Riverfront, Commons Park. The park is a place for people to gather and reflect while having access to the South Platte River.

case study #3

Denver knows the importance of parks and the river corridor as both respites and connections (Chandler, 2002). The results of the downtown area are impressive: “for residents, 80 plus acres of public parkland (out of a river chain of more than 100 acres), river access, and recreation facilities; for developers, land for high-end housing, retail, and office space lured by these new parks; for the city, new property tax revenue and removal of a big swath of blight; for wildlife, a cleaner river and shoreline” (Chandler, 2002, p. 88).



Figure 47. South Platte Riverfront, Confluence Park. The park was the early impetus for the city to turn to its river resources for recreation, respite, and protection of wildlife.

Thoughts

One element of my thesis is the notion of connection. This case study exploits the different uses an urban waterfront can bring by connecting neighborhoods through a river. A river can often times be viewed as a barrier between one side of the river to the other, but the South Platte River works with trail systems and greenways to unite each side. This allows for pedestrian trails being used to guide people through the urban setting with a strong connection to the downtown district.

The Mississippi River in St. Cloud has a major disconnection between each district, and it will be important going further in my research to devise a system of strategies that can create a unified connection between communities by using the riverfront.

summary of case studies

Above The Falls

The Above the Falls case study is a good example to show the importance of bringing people out of the downtown to enjoy the waterfront. Similarly to St. Cloud, ATF recognized the poorly developed water's edge and riverfront access and changed the riverfront in ways to draw the community to their forgotten river. This recognition allows opportunities for families to participate in outdoor recreational activity. This activity will bring people closer to nature and enhances physical, spiritual, and mental well-being.

Continuing development of the ATF master plan shows the strategy of focusing on immediate impact areas that won't be affected by future designs. This is important to be aware of in order to be cost effective and to provide a hierarchy of important elements needing to be accomplished.



Figure 48. Minneapolis, Mississippi River.

Paseo Del Rio (Riverwalk)

This case study is unique in its rich history and its tie to San Antonio's local community. Going back to Hugman's initial design proposal built in 1941 and going through all of the different design phases through the years, each design has a strong correlation between designers/developers and public opinion. This strong public connection is one of the reasons why the San Antonio River Walk is so successful. While developing my design thesis, it will be important to recognize the needs of the public when analyzing the city of St. Cloud.

The San Antonio River Walk is directly located in the heart of the downtown district, and with the development of a river corridor, it shows the numerous impacts a riverfront can have on a community. Beneficial effects on the economy, ecology, and culture are evident in this case study. Although the Mississippi River in St. Cloud differs in demographics, the amount of water, the width of the river, and climate, it is still important to acknowledge San Antonio's ultimate goal of bring people to the waterfront and creating unique spaces and uses for the community, resulting in the state's greatest tourist destination.

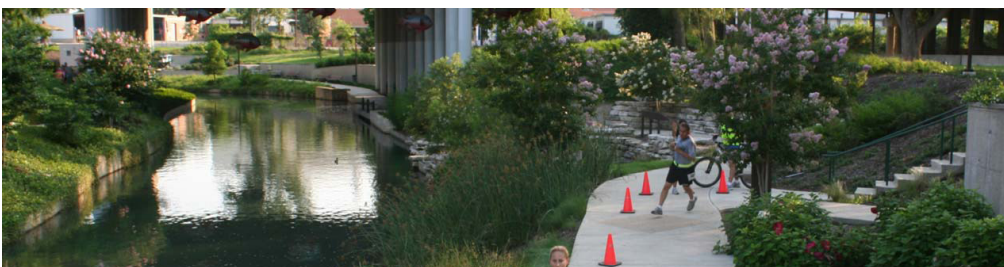


Figure 49. San Antonio River Walk.

summary of case studies

South Platte Riverfront

The South Platte River is a great case study showing the resilience of a river and a city. Once degraded by industrialization, the riverfront is thriving as both an economical and ecological asset to the community. Ten and a half miles of trails in the heart of the city's origin connect a series of parks that provide various amenities for recreation, reflection, and artwork. The South Platte Riverfront can be viewed as a symbol of success.



Figure 50. South Platte Riverfront. Confluence Park, 2008.

climate data for st. cloud, mn

Overview

With the site being located in central Minnesota, it is important to know the different seasons the region brings. Four seasons a year make it especially important for a design to be enjoyable year round. Figures 51 through 63 are explained and analyzed according to my design thesis in St. Cloud, Minnesota.

Average Temperatures

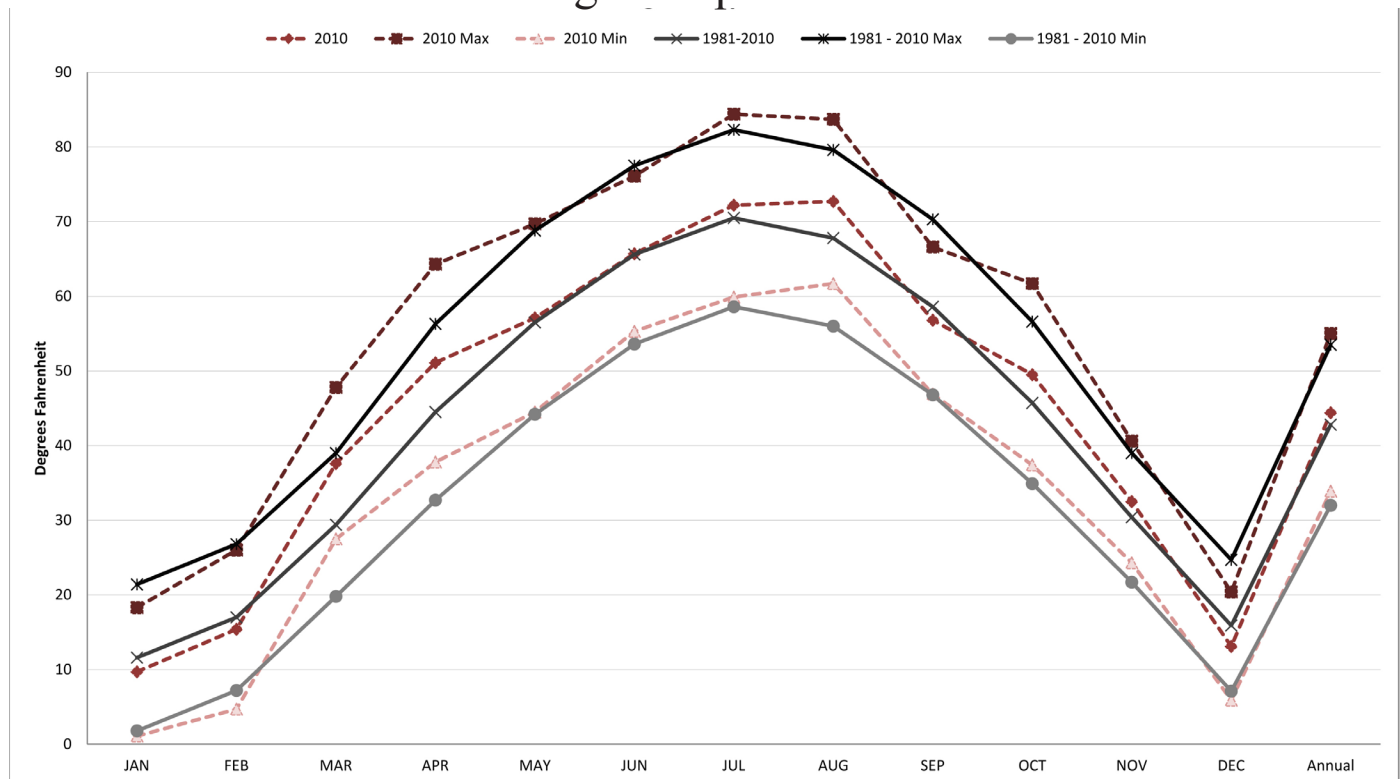


Figure 51. St. Cloud, MN.

The average temperature is important for determining when people will most likely use the river corridor in St. Cloud. April through October have average temperatures roughly above 50F, which is suitable weather for outside activity. The cooler months of November to March can be expected to have less outdoor activity along the river corridor. These months will need to incorporate winter activities such as skiing and ice skating.

In 2010, the annually temperature was 44.4F and the annual temperature through 1981 to 2010 was 42.8F. This could mean temperature may be slightly rising as the years go on. In this case, it will be important to locate and use different types of shade trees for people to cool off during warmer months.

climate data for st. cloud, mn

Growing Degree Days

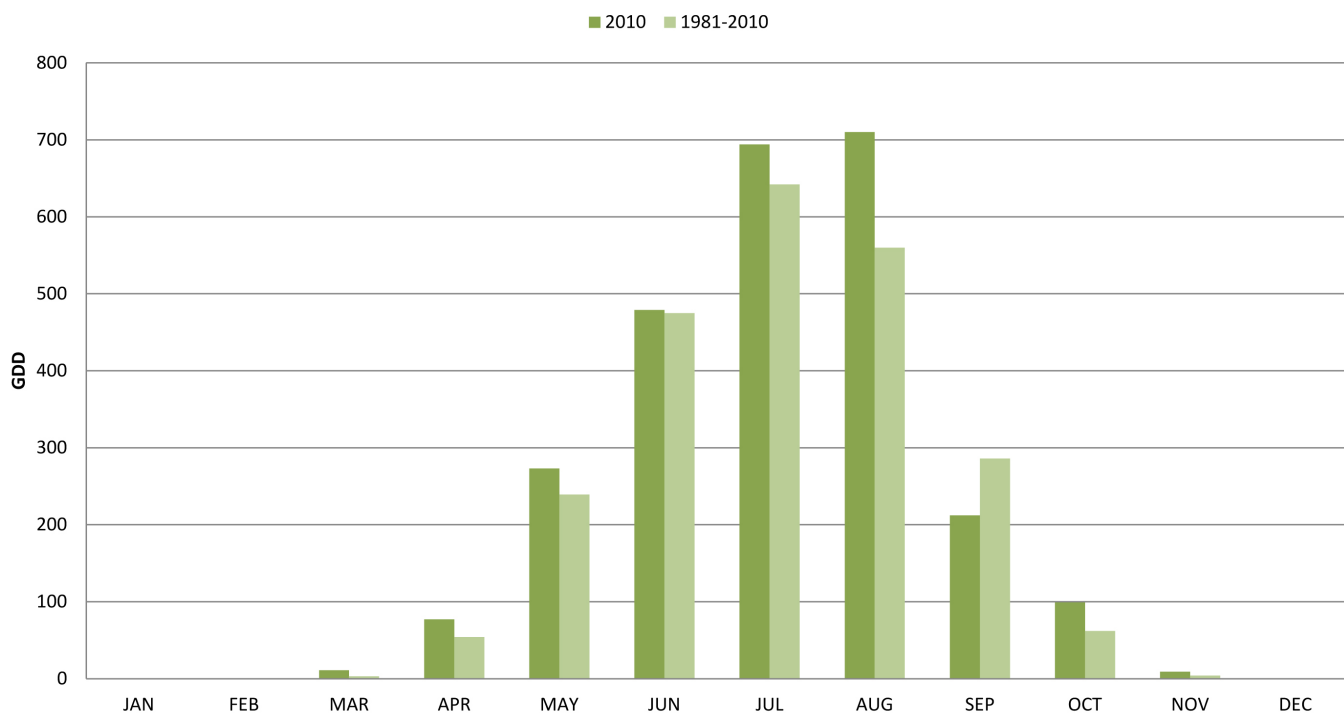


Figure 52. St. Cloud, MN.

The growth rate of many biological organisms is primarily controlled by temperatures (Gibson, 2003). Growing degree days (GDD) are used to predict vegetation development rates, which can determine when a plant may bloom or reach maturity. It is defined by a base temperature, which in this case is 50F, and temperatures above that number increase the growth rate. For St. Cloud, the months from June to August can expect to have the most growth in vegetation.

Humidity

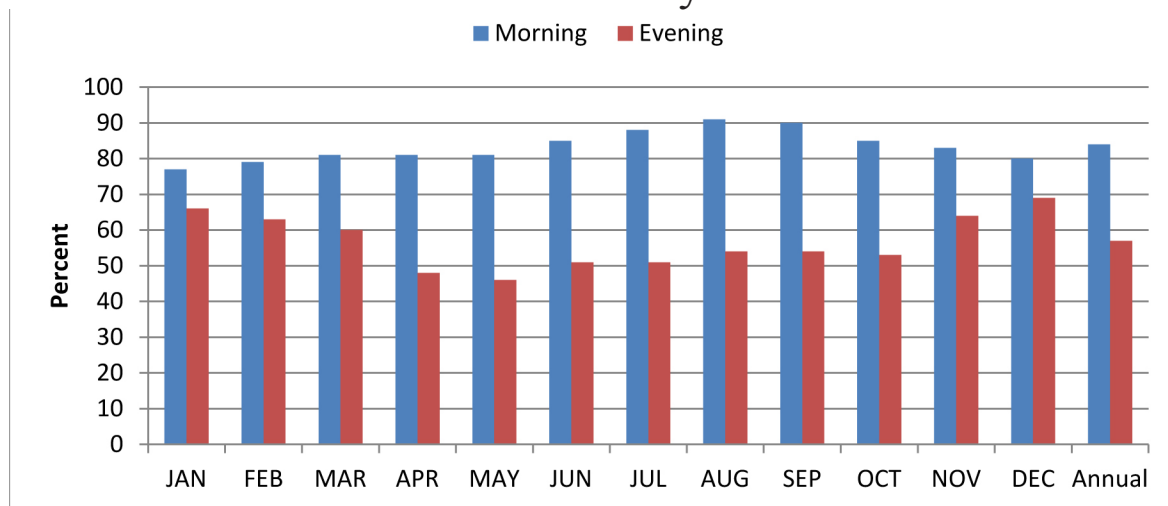


Figure 53. St. Cloud, MN.

The percentage of humidity can be related to the human comfort level of people. This can be used to approximate when more people may be outside, and when there is a higher level of humidity, more people may want to be by the river to cool down. There is a higher humidity in the mornings in St. Cloud than in the evenings.

climate data for st. cloud, mn

Heating Degree Days & Cooling Degree Days

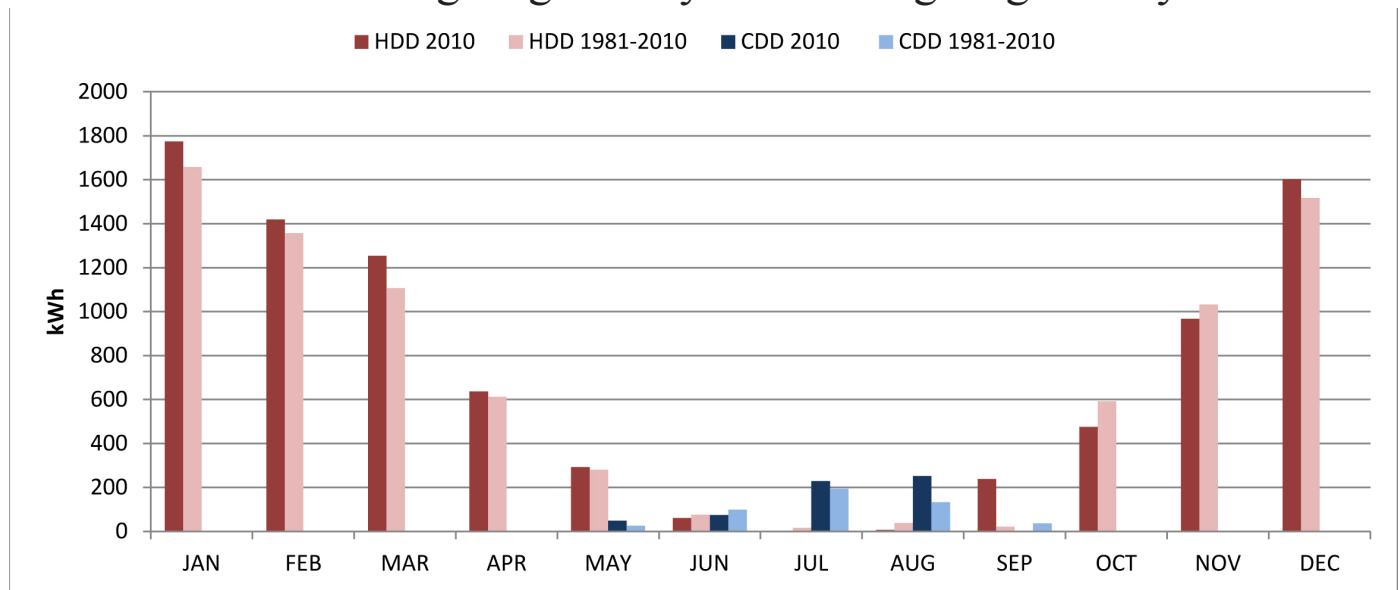


Figure 54. St. Cloud, MN.

Heating degree days and cooling degree days are calculations relating to the effect of outside air temperature on building energy consumption. (“Custom degree day,” 2011) Defined by a base temperature, in this case 65F, it will allow one to predict the amount of energy used to heat or cool a building in kilowatts per hour (kWh). For St. Cloud, the months of November to March can expect to have the most energy used to heat a building. June through August will have the most energy used to cool a building.

Visibility

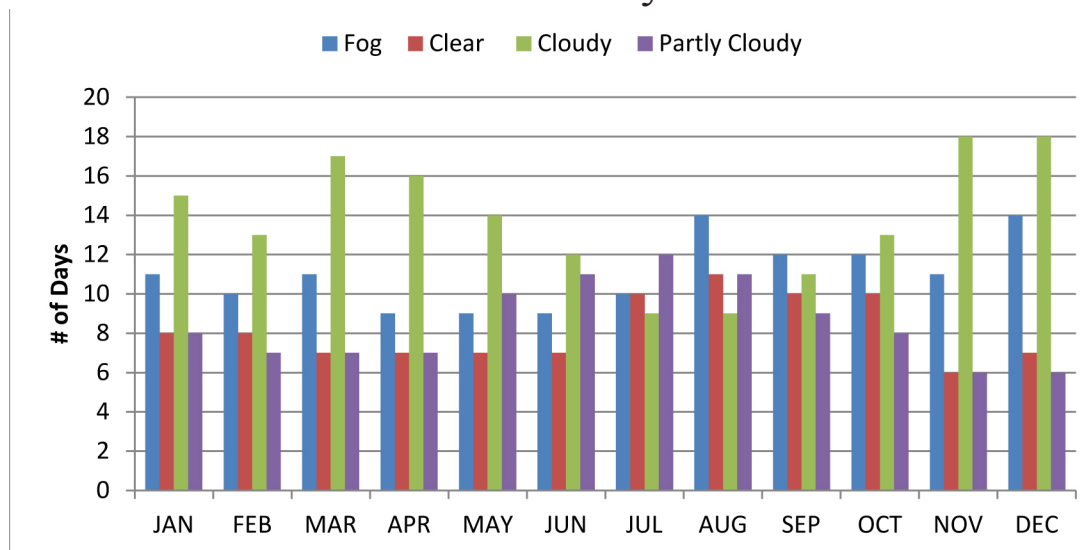


Figure 55. St. Cloud, MN.

Visibility data is measured by the average number of days in a month that it may be foggy, clear, cloudy, and partly cloudy. This can be used to determine how far one may be able to see a certain focal point during a given month.

climate data for st. cloud, mn

Wind Speed

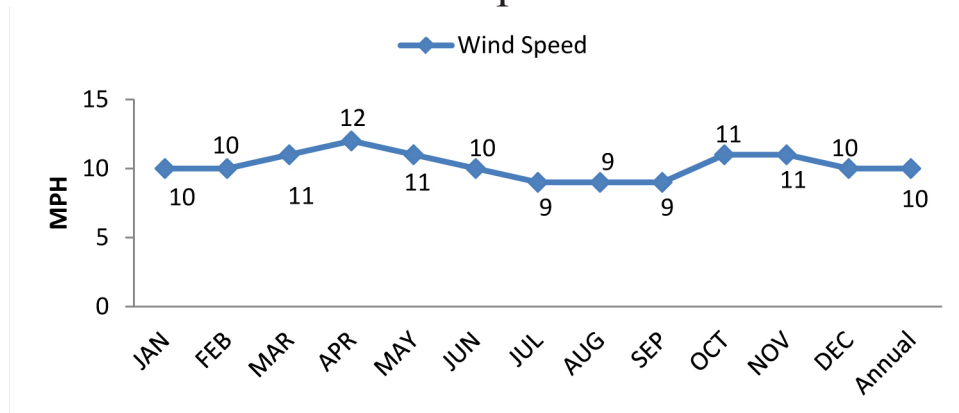


Figure 56. St. Cloud, MN.

There are higher wind speeds through the months of March through May, October, and November. This is important for determining the use of tree barriers to slow wind speeds down.

Snowfall & Snow Depth

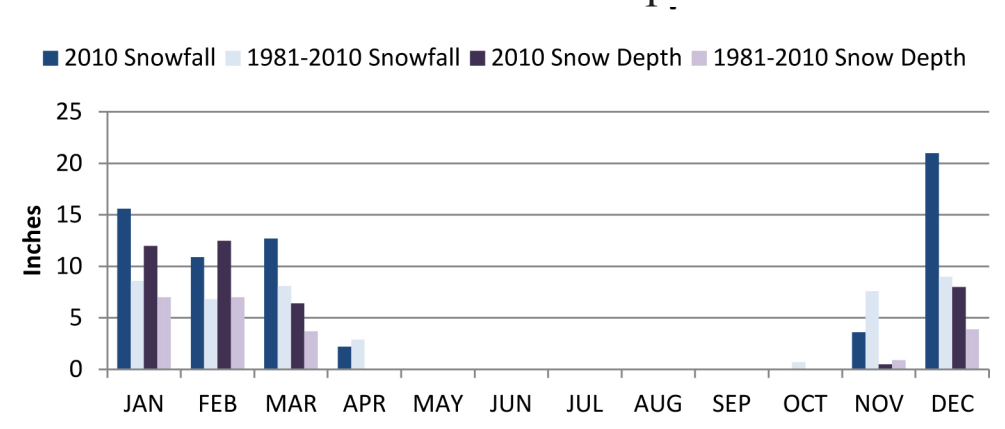


Figure 57. St. Cloud, MN.

Snow fall is the average amount of snow that has fallen in a given month, and snow depth is the average depth of snow in a month. According to the data in 2010, St. Cloud had its greatest amount of snowfall during December and January. These months can promote community winter activity such as building different types of snow structures. Incorporating areas for this may help build a stronger community connection.

climate data for st. cloud, mn

Precipitation

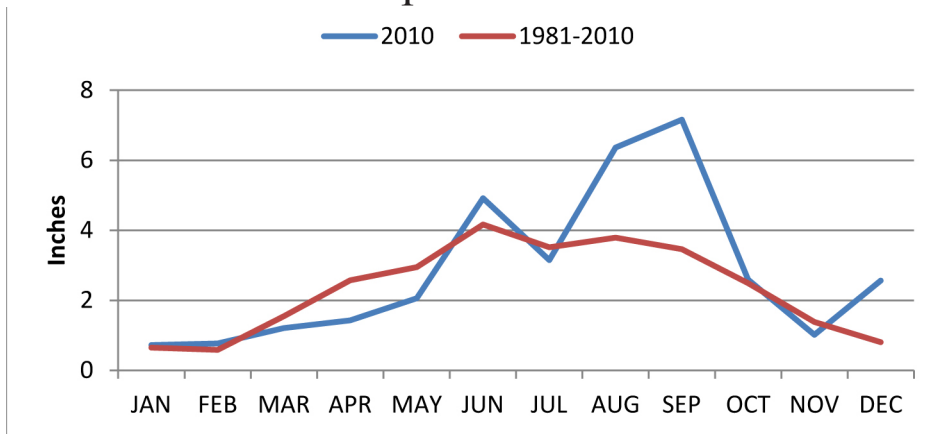


Figure 58. St. Cloud, MN.

Comparing the precipitation from 2010 to 1981 through 2010 precipitation suggests that St. Cloud is averaging more rain than in the past. This trend may continue, so it will be important to consider areas where people can take shelter from the rain but can still be outside to continue activity after the rain subsides.

Mississippi River Water Discharge (1989-2010)

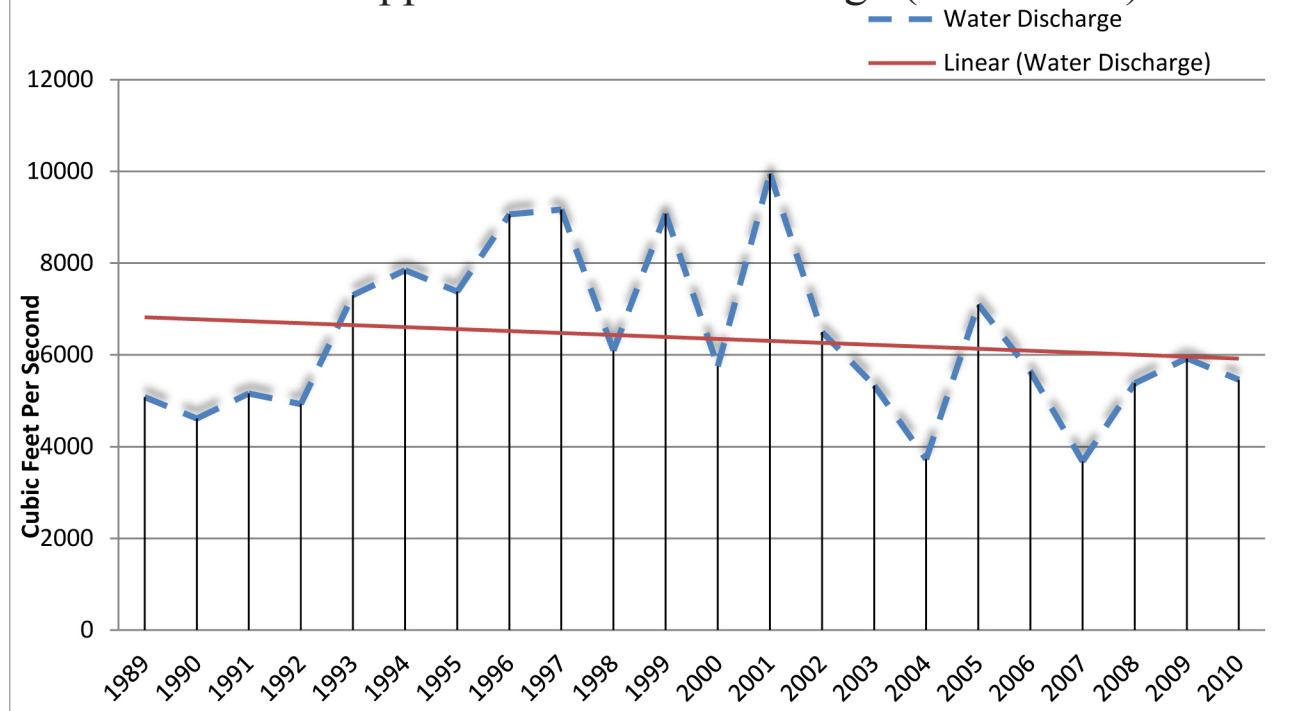


Figure 59. St. Cloud, MN.

This data is used to get an idea of the average flow of water through the past 21 years. The linear line in the red suggests a downward trend in the discharge rate along the Mississippi River in St. Cloud.

climate data for st. cloud, mn

Mississippi River Historical Highs

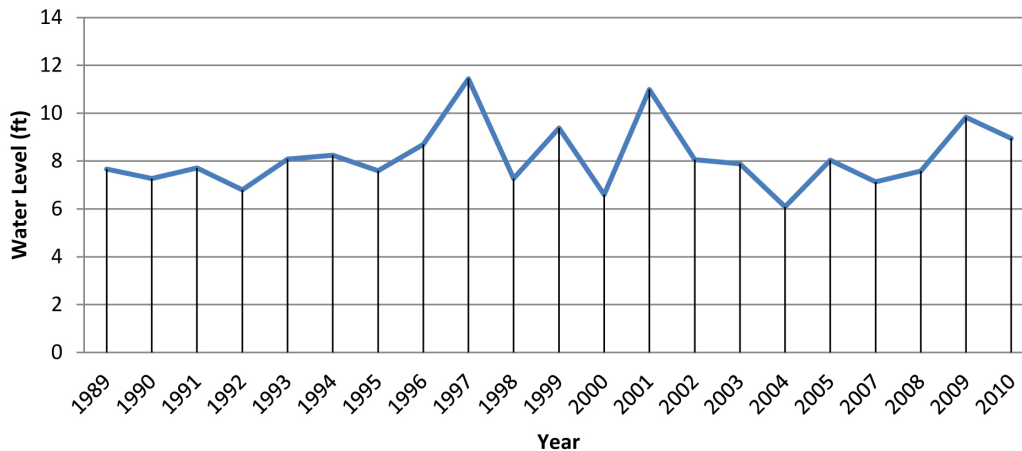


Figure 60. St. Cloud, MN.

Mississippi River Historical Lows

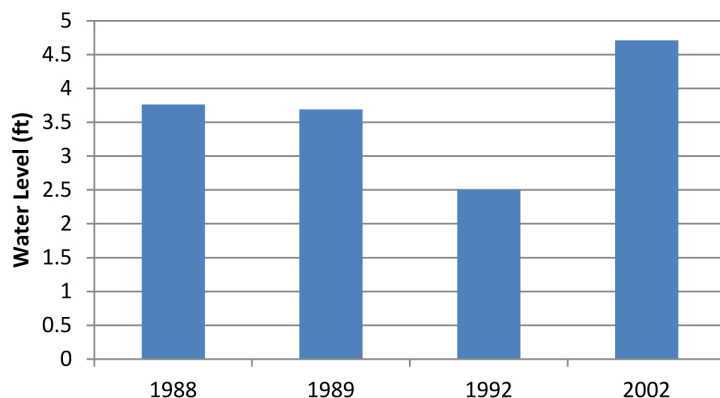


Figure 61. St. Cloud, MN.

Knowing historical high water and low water of the Mississippi River in St. Cloud is important to be aware of when building along the river. Knowing how high the water goes will help determine placement of vegetation, trails, and infrastructure, in order to sustain against high water levels. Knowing how low the river can get will help determine where vegetation may need to be added to help prevent erosion. Also, seeing how the Mississippi River water level varies, it may be important to add terraced infrastructure along the river corridor for accessibility during low and high waters.

climate data for st. cloud, mn

Mississippi River Monthly Water Discharge

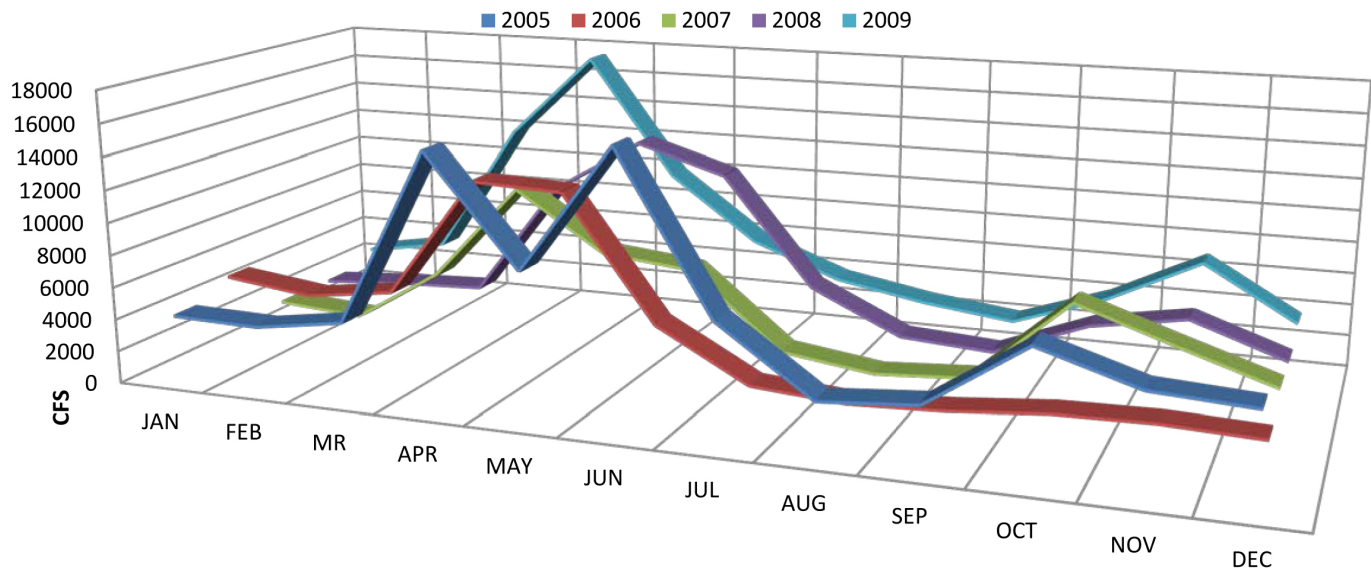


Figure 62. St. Cloud, MN.

This data can be used to determine what months water recreation may be the best. The five year (2005-2009) discharge average suggests that during the months June through September, the water is moving the slowest.

Mississippi River Surface Water Depth & Peakflow Discharge

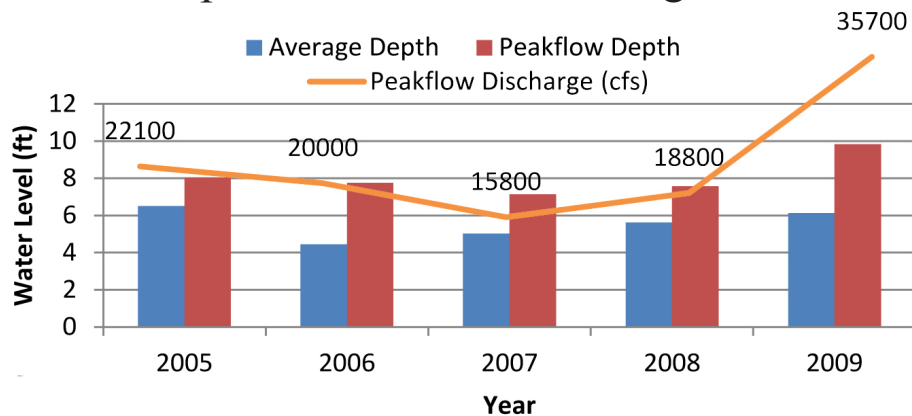


Figure 63. St. Cloud, MN.

This data is the yearly average of river depths, peakflow depths, and peakflow discharge in 2005 through 2009. Knowing the average water depth of the Mississippi River will help determine where it will be most appropriate to build trails and other infrastructure. Also, considering the average depth and high of the water can help determine the different levels of a terrace built along the river's edge. Knowing how fast the water can move during its peakflow can help assist in determining water recreation activity.

historical context

History of St. Cloud

The city of St. Cloud, Minnesota, was established in 1856. The town was composed of a collection of small villages: Upper Town, Middle Town, and Lower Town. The villages are located along the Mississippi River with Middle Town being located where the heart of downtown St. Cloud is today. Each small village had distinguishing background characteristics; Upper Town was settled by southerners who brought servants from Tennessee, Middle Town was earlier a homestead taken over by a French Huguenot settler named John L. Wilson, Lower Town was settled by “Yankee loving Protestants,” who demeaned a local Gothic Revival Style hotel (“Historic Downtown,” n.d).



Figure 64. St. Cloud, MN, 1907. St. Germain Street

Middle Town

This town is most known for French descendent John Wilson who purchased a 320 acre homestead and sold land, even giving away land, to devoted business men. The offer attracted people to the area, which predominately became settled by industrious German Catholics seeking location for a German Colony. Wilson is also known as the founder of St. Cloud; he chose the name from a Paris suburb after reading a biography of his admirer, Napoleon. (“Historic Downtown,” n.d)

Lower Town

This area was developed by George F. Brott, who owned the first local newspaper company in St. Cloud called the Minnesota Advertiser. Brott described himself as “farmer, wagon and carriage maker, real estate dealer, editor, townsite promoter, owner of flour mills, steamboats and sailing craft, merchant, member constitutional convention, colonel of engineers, canal and railroad president and inventor” (“Historic Downtown,” n.d). He ended up passing away in 1902, in Washington, DC.

historical context

Also in Lower Town was the home of the Stearns House, which was the Gothic Style Hotel mentioned previously, located on property of the “St. Cloud Normal School Campus” (“Historic Downtown,” n.d). Interestingly, the school stayed in the same area and is currently the home of St. Cloud State University.



Illustration 48. John Wilson.

Interesting Downtown History

An early unique local attraction to downtown was Steve Ten Voorde’s Bicycle Band. During the mobile age, Ten Voorde fashioned special bicycle handle bars which held musical instruments (“Historic Downtown,” n.d). This was later shutdown a year after by St. Cloud’s first automobile shop in 1899, which was owned by Ten Voorde and Peter Theilman. In 1905, the city sported 5 automobiles among nearly 10,000 residents (“Historic Downtown,” n.d).

In 1897, a man who had built a reputation on the art of candy making came to settle in the city. Candyman Jones, opened a business called Jones Candy Co., which was popular for 39 years before closing. The name Jones was carved in granite and is still visible today on the front of the St. Cloud Floral building (“Historic Downtown,” n.d).

In the 1880s, an important developer named John Neimann came to settle in St. Cloud at the age of 24. He was already skilled in the building trade and became one of the leading contractors and builders in the area (“Historic Downtown,” n.d). Buildings he worked on are St. Nicholas Church, St. Raphael’s Hospital, Carter Building, and part of Norman School where St. Cloud State University is located today.



Figure 65. St. Cloud, MN. Early Streetscape.

historical context



Figure 66. St. Cloud, MN, 1885. Mitchell Building.

The Sherman Theatre and Breen Hotel use to serve as a local vaudeville, film, and legitimate theatre before falling to disrepair in the mid 60's. Byron Barr used to usher in the building and is now known by the name Gig Young, who is an academy award winning actor. The building was entirely restored in the 1990s and is now home to the Paramount Theatre and Germain Towers, where over 80,000 people use the building each year ("Historic Downtown," n.d).



Figure 67. St. Cloud, MN, 1893. Fandel & Nugent.

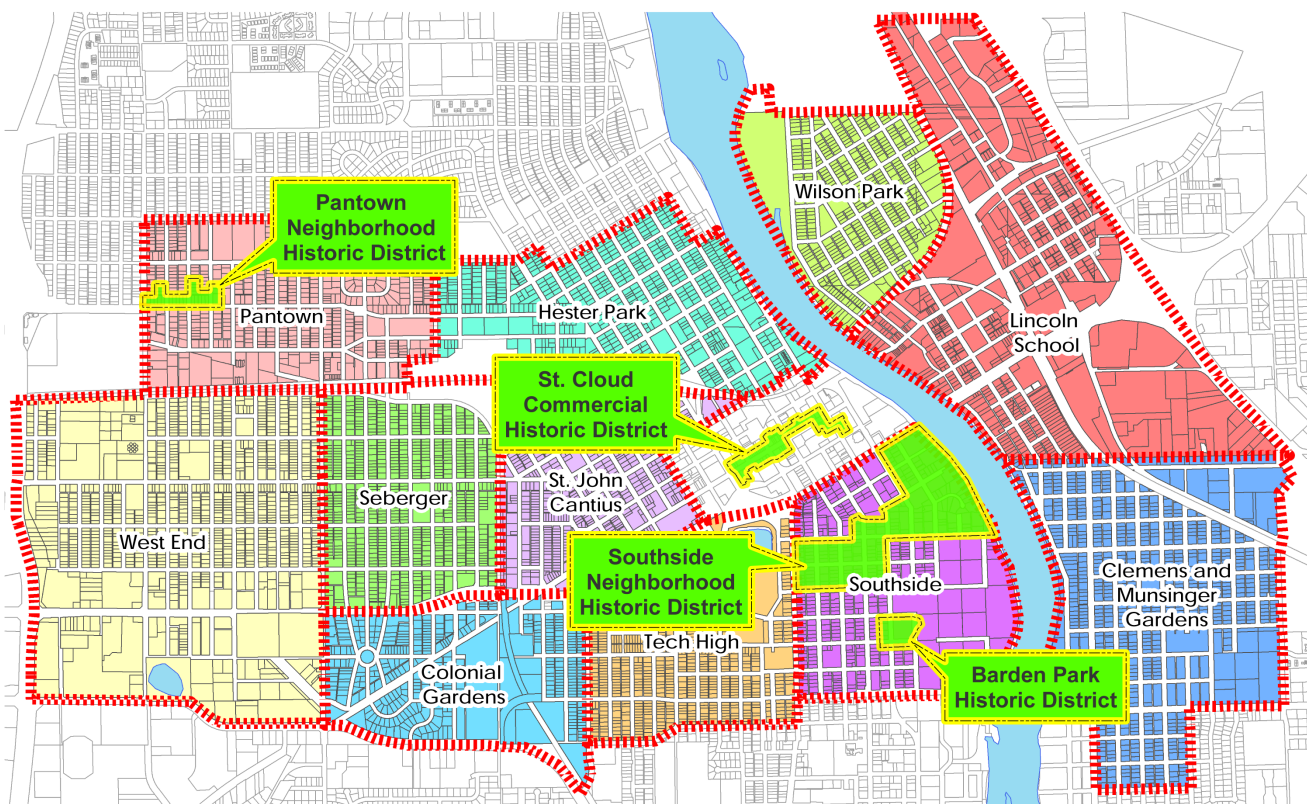
historical context

Thoughts

The downtown district (Historic Downtown) of St. Cloud has a rich historical past containing the town's heritage. As the city has been trying to preserve these areas through the years, St. Cloud was added to the Preserve America Community in 2005. "Preserve America is a federal initiative that encourages and supports community efforts to preserve and enjoy our priceless cultural and natural heritage" ("Preserve America," n.d). This is already an important aspect to the city, and my design thesis can carry this out further into the river corridor.



Local Historic Districts - 2005



This map is neither a legally recorded map nor survey and is to be used only for reference purposes. The City of St. Cloud assumes no responsibility for actual or consequential damage incurred as a result of using this data.

Prepared by the St. Cloud Planning Office, 11/05. File location: K:\CityData\Planning\Projects\neighborhoods

0 0.125 0.25 0.5 Miles

Figure 68. St. Cloud, MN, 2005. Local Historic Districts

Historic Districts are currently located near the Mississippi River, and it may be beneficial for the culture of St. Cloud to pull historic elements into my design proposal. Looking at Figure 68 shows the areas of each historic district in St. Cloud. Opportunities of building strong connections to the areas closest to the river are present, which can promote further awareness of the community's cultural history while providing an educational experience.

historical context

History of the Mississippi River

The Upper Mississippi River area (where St. Cloud is located) was home to several American Indian nations before the coming of the white man. Early Indian nations included the Cheyenne and later the Dakota and Ojibway tribes (Minnesota, 1996). Native Americans and white settlers used the river as a water highway, hunting ground, and place for settlement. As settlements developed along the river, it made the Mississippi early conflicting grounds between Dakota, Ojibway, and other tribes.



Figure 69. St. Cloud, MN, 1869.

The first white men of the area were mainly trappers, traders, and explorers. There were many trading posts developed along the Mississippi River, specifically between the areas that are now St. Cloud and Anoka. A few famous early explorers of the area are Father Hennepin, Jonathan Carver, Zebulon Pike, J.C. Beltrami, and Henry Schoolcraft (Minnesota, 1996).

The lumber industry became an important part of the Mississippi River in the mid and late 19th century. Several towns between St. Cloud and Anoka had large sawmills that could process large amounts of lumber. Other important industries were flour milling and rock quarrying.

historical context

With settlements increasing came the development of transportation networks. The most famous network is the Red River Ox Cart trail, which small pieces of can still be seen. These trails ran parallel to the Mississippi River along the east side, connecting southern areas, like St. Paul Minnesota, to northern areas, like the Red River Valley. The trails were mainly used by settlers and tradesmen. Another transportation method was by steamboat, which became important in the 1850s and 1860s. (Minnesota, 1996).

In the early 1850s, many people thought of St. Cloud as the head of the Upper Mississippi navigation; however, this wasn't the case. Sauk Rapids was the early terminate for continuous navigation between St. Anthony and Crow Wing (which was a major route) because of the shallow waters just north of the St. Cloud area. The major steamboat route was from St. Anthony to St. Cloud. Once you get north of Sauk Rapids, where the river is twenty feet deep, there was navigation for a good two hundred miles (Reps, 1994). The steam boat era came to an end by the 1860s due to a severe drought that the Mississippi suffered from.

The Mississippi River is directly linked to the city of St. Cloud and its early success. According to Minnesota Department of Natural Resources (1975), the area along the Mississippi River corridor from St. Cloud to Anoka has historical values of "statewide significance because of the integral part which the river has played in the exploration, settlement, and development of Minnesota" (p. 3).

Interesting Facts About St. Cloud

- 1867, first bank opened.
- 1870s marked a period of growth in the downtown area. Mainly consisted of blacksmiths, wheelwrights, grocers, druggists, hardware men, and bankers.
- 1883, first gas lamps installed as well as first phone service.
- St. cloud was headquarters for the Red River Oxcart Co.
- By 1880s, St. Cloud became a well equipped city with complete electric and gas lights, piped water, and sewage systems.
- A tornado on April 14th, 1886, destroyed most of downtown Sauk Rapids and made business owners move existing facilities and services to St. Cloud. This led St. Cloud into being the dominant city in the area and into an economic boom. In 1880 to 1892, the population of St. Cloud expanded from 2,500 to nearly 10,000 people.

Information found from (Reps, 1994), ("Historic Downtown," n.d), and (Minnesota, 1996).

project goals

Academic Goal

The academic goal for this thesis project is to provide valuable knowledge on the way a river corridor can function within an urban community to enhance social, economic, and cultural elements of a city while improving human physical, emotional, and mental well-being. This is developed by analyzing current uses of a river corridor and identifying missing links that may be beneficial to a city. The goal is achieved through in-depth documentation and analysis that can be used for future academic uses.

Professional Goal

The professional goal for this project is to create a clear, cohesive document that can be presented outside of the academic world and into the professional realm. The document should show professional level skills of analyzing, problem solving, graphic display, and rendering to communicate project findings and proposals. Thus, the finished project may propel me into desired professional work.

Personal Goal

The personal goal for this thesis document involve learning, analyzing, and building upon skills and knowledge learned from the past and enhancing them for the future. Another goal is to use this design thesis as a stepping stone in the academic world that will prepare me for my future career of landscape architecture.

site analysis

Why choose the Mississippi River corridor area around St. Cloud as a design thesis?

- The location is an urban community with a poor connection to the river, specifically in St. Cloud.
- The area is expanding and the city is proposing to revitalize the Mississippi River corridor.
- There are major disconnections with pedestrian and bicycling trails, however, at the same time, there is a great opportunity to enhance existing trails and to strategize a systematic network of routes that could potentially go beyond the site location.
- The St. Cloud area is already a beautiful location, and creating a successful river corridor could build economic and social growth that would ensure the community's future.

site analysis

Site Context



site analysis

River Uses




Sartell

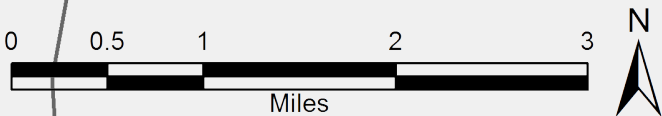
Sauk Rapids

St. Cloud

Mississippi River



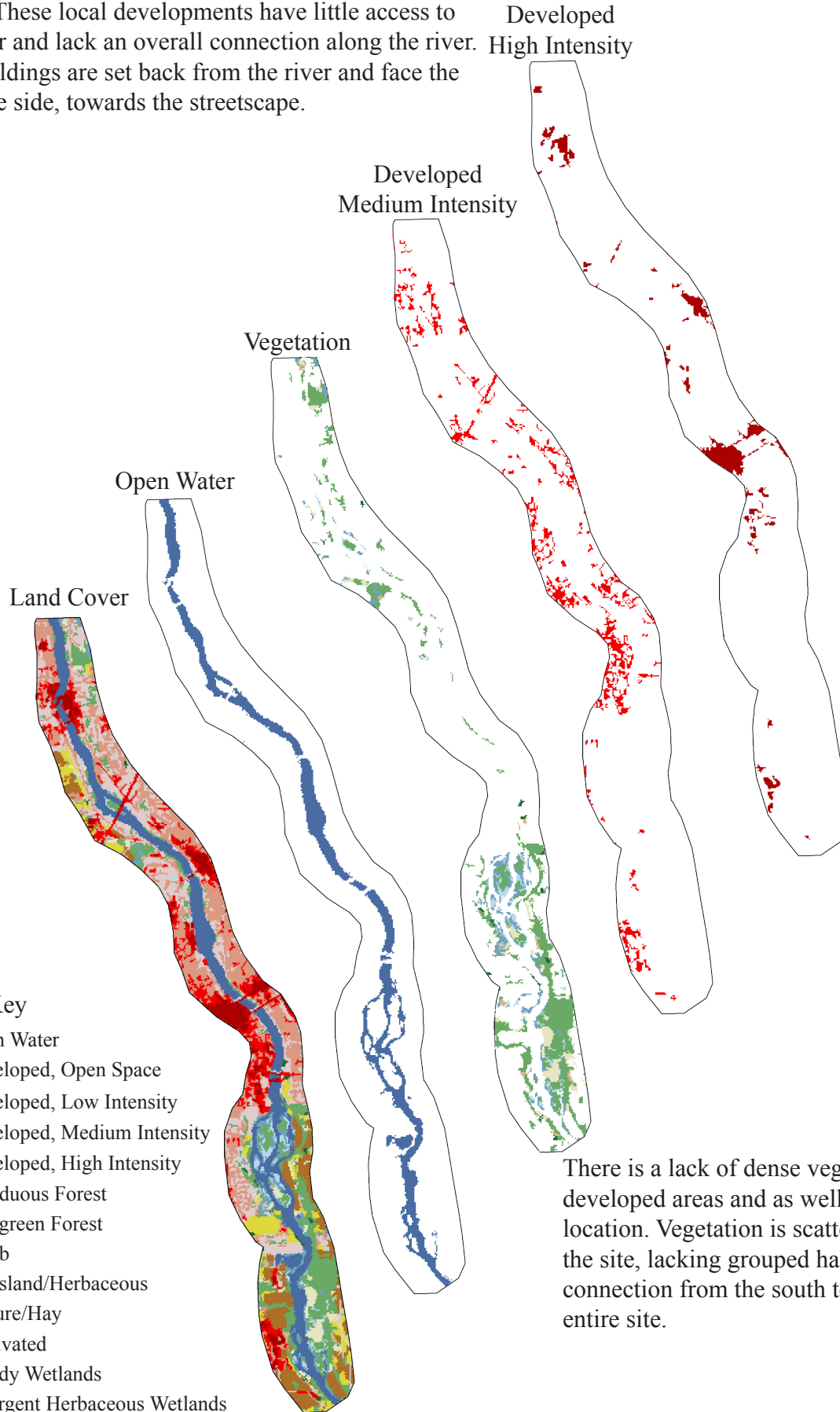
-  Boat Access
-  Fishing Area
-  Dam



site analysis

Land Cover

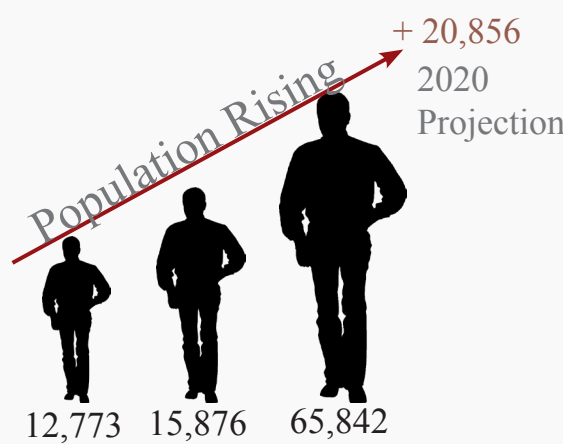
The site location along the Mississippi River corridor mainly consists of medium and highly developed areas. These local developments have little access to the river and lack an overall connection along the river. The buildings are set back from the river and face the opposite side, towards the streetscape.



There is a lack of dense vegetation cover in the developed areas and as well in the overall site location. Vegetation is scattered throughout the site, lacking grouped habitat areas and connection from the south to the north of the entire site.

site analysis

Developed Medium to High Intensity

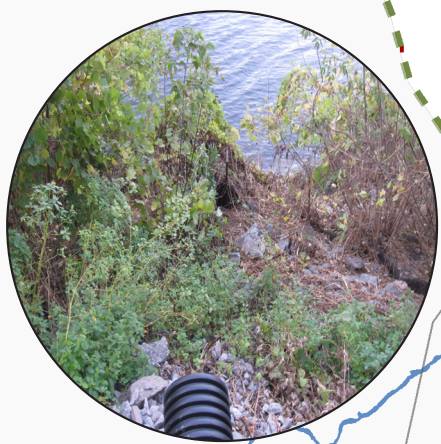


Sartell

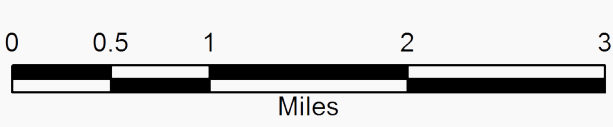
Sauk Rapids

St. Cloud

Mississippi River



Downtown St. Cloud
Stormwater Outlets



- Developed Areas
- Stormwater Outlet

site analysis

Developed Medium to High Intensity

Sartell

Sartell is the smallest city in the site location but the town is expanding. There is a good pedestrian connection to the city on the east side of the Mississippi to Sauk Rapids. However, the highly developed areas do not attract out of town people. Its major development on the river also acts as a barrier to the river corridor, the Verso Paper Sartell Mill.

Sauk Rapids

This area provides the best walking and bicycling connection to and along the river corridor, specifically on the east side of the river. However, Sauk Rapids has been developed away from the river, making the distance between the river and developed areas greater. The bridge constructed across the Mississippi is very pedestrian friendly and provides a good connection to the other part of town.

St. Cloud Area

St. Cloud has consistent materials like benches, pavement, and signage but only in a few locations. The east side of the Mississippi seems totally different from the west side. The main developed areas on the east side consist of retail buildings, fast food restaurants, and other commercial buildings. Also, the east side seems for out-of-date compared to the west side of the river. This could be why it feels like you're in a different town when visiting the east side compared to the west side.

The west side of the Mississippi River is where St. Cloud's downtown area is. This area has a totally different atmosphere, more people walking around, more outside lights, updated materials, and a night life. Popular bars and restaurants and St. Cloud State campus are on this side. Although there are more people on the west side, there is a lack of a connection and access to the river. This developed area, more populated with the nearby campus, holds the most potential for local residents to have access to and use of the river corridor.

Summary

Each developed area has its own unique characteristics to it; however, there is a major disconnection between these the highly developed areas. One of the major reasons why there is a disconnection is because the dense areas are separated by residential housing. Further analysis will have to strategize ways to connect the high intensity development areas. A key element may be the use of boardwalks to create a strong river corridor connection.

Great Blue Heron



Kingfishers



Wild Turkey



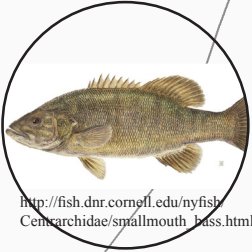
River Otter



Walleye

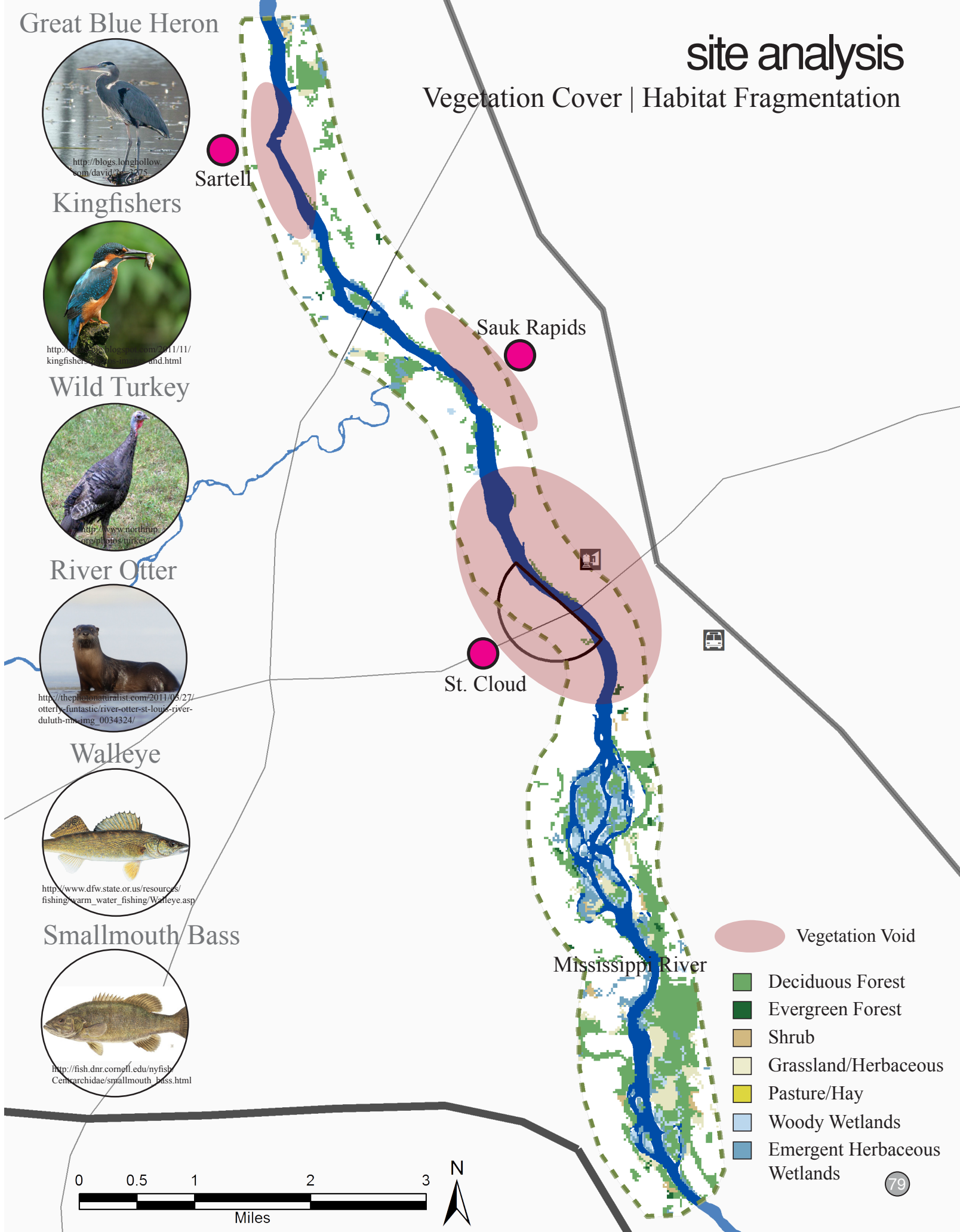


Smallmouth Bass



site analysis

Vegetation Cover | Habitat Fragmentation



site analysis

Vegetation Cover | Habitat Fragmentation

The vegetation cover and habitat fragmentation map is used to show that the existing vegetation cover is within the river corridor and to raise awareness of the disconnection between them. The total vegetation covers only about 25% of the total 11 mile river corridor.

The majority of the vegetative land cover in the corridor is deciduous forest, over half of which is located in the southern portion of the map. The voids between the deciduous areas are the results of intensively developed locations. The major issue is with species diversity throughout the Mississippi River corridor. Vegetation provides natural habitats for wildlife, and major voids in the land due to development cause native species to be confined in a small area. The goal would be to provide and increase native vegetation that connects to existing habitats, which would allow for wildlife to expand along the river corridor. This would provide the opportunity for nature to expand into the urban setting, which would create aesthetically pleasing environments while incorporating people with wildlife.

site analysis

Elevation & Water Drainage

Sartell

Sauk Rapids

St. Cloud

The darkest areas on the map indicate the lowest elevations and the lighter areas are the highest. From the elevation contours you can see where the steepest slopes are; those areas will have to be carefully monitored for erosion control issues.

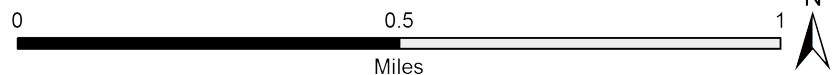
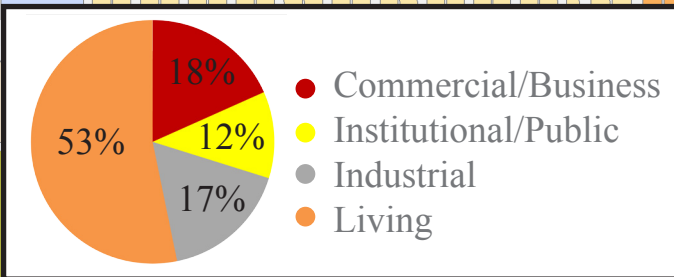
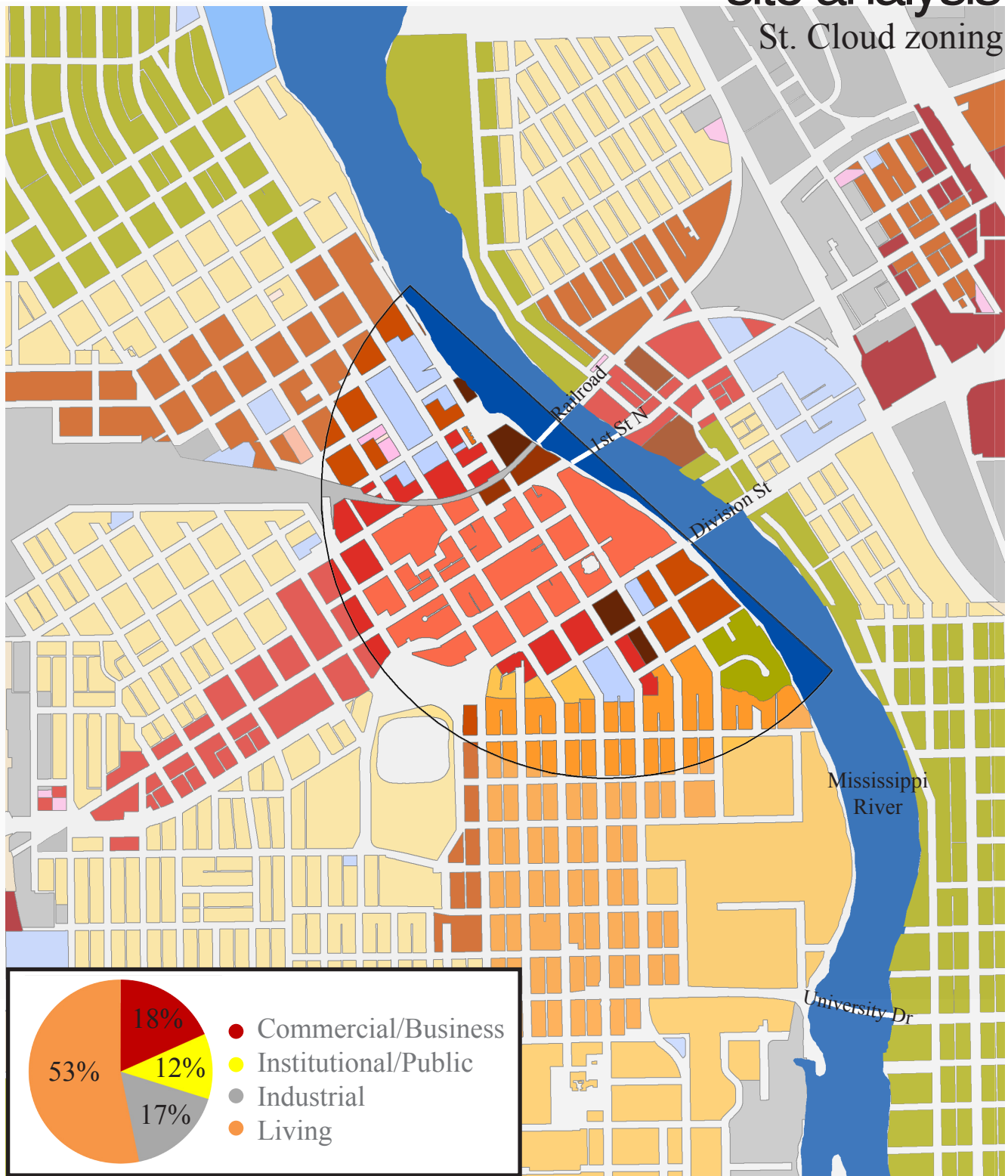
Focus Area (1/2 mile radius)

0 0.5 1 2 3 Miles



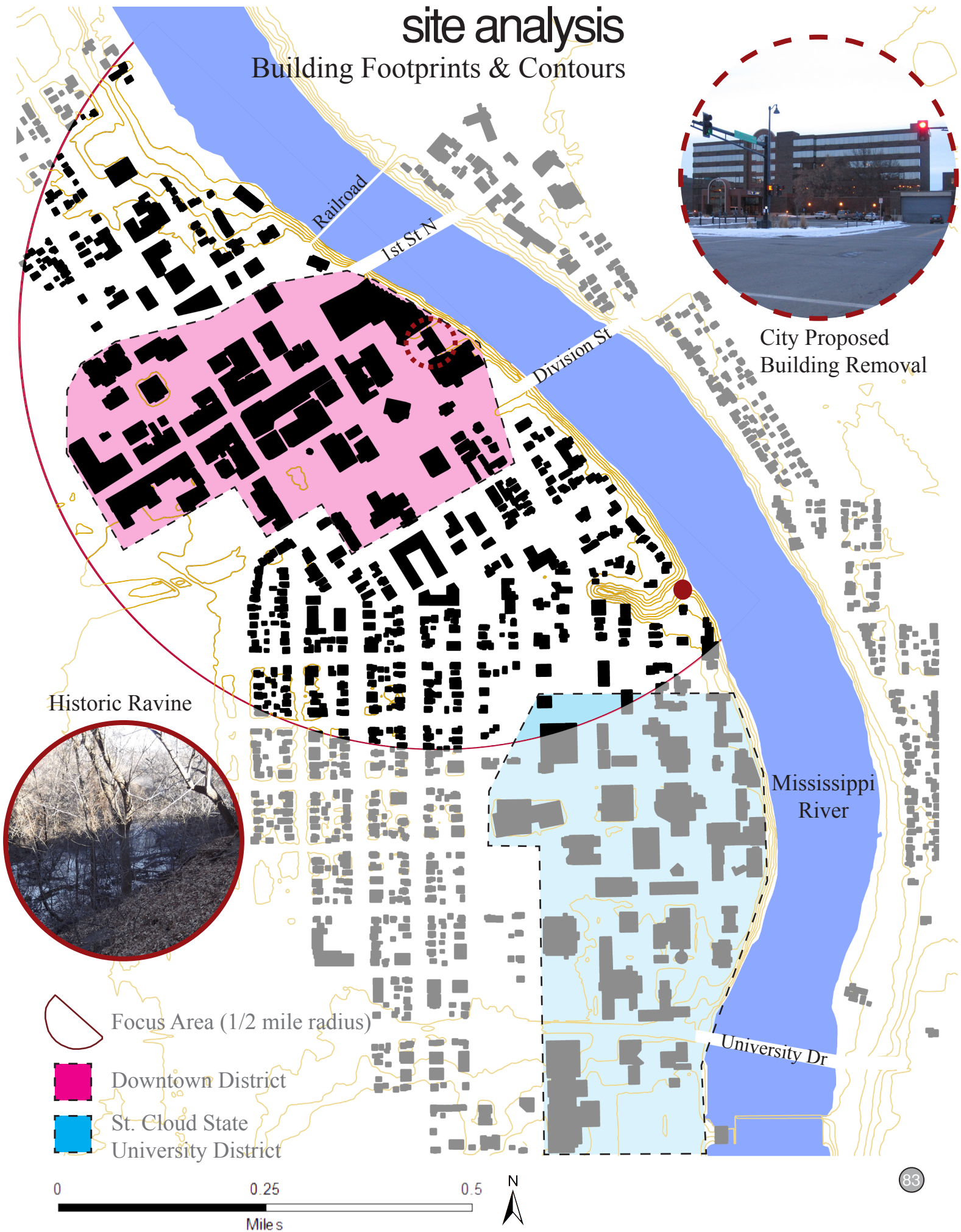
site analysis

St. Cloud zoning



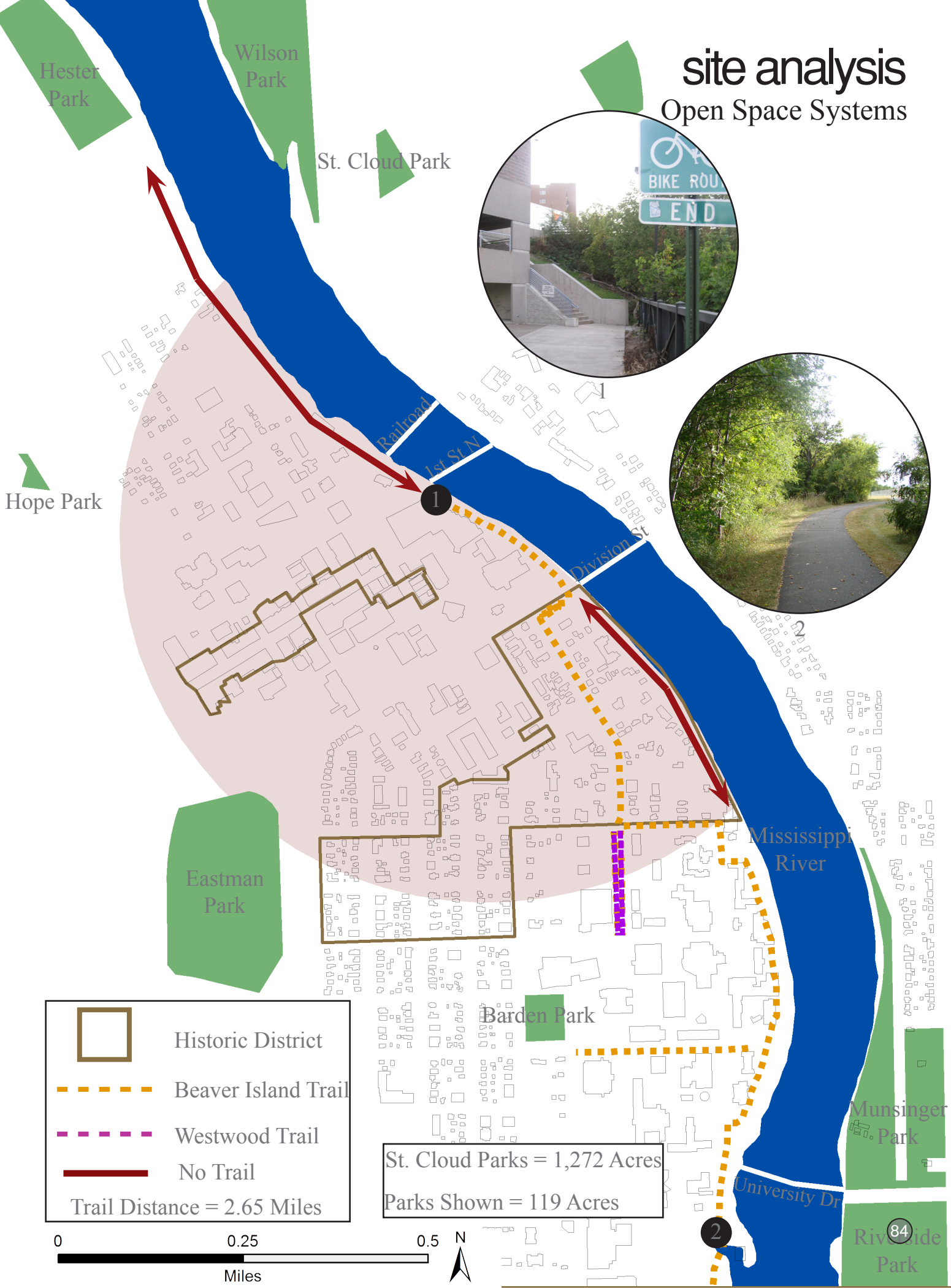
site analysis

Building Footprints & Contours



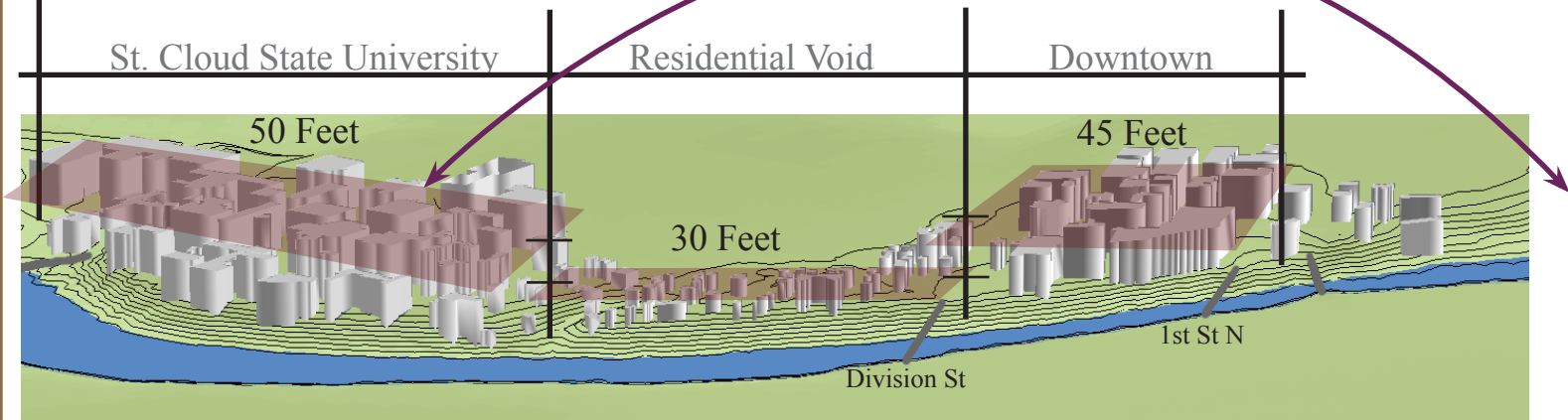
site analysis

Open Space Systems



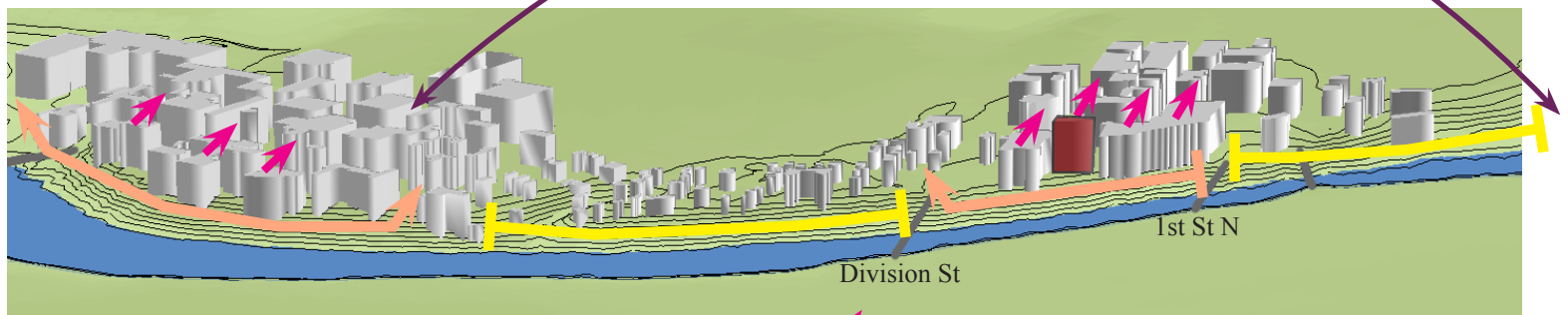
site analysis

Urban River Corridor

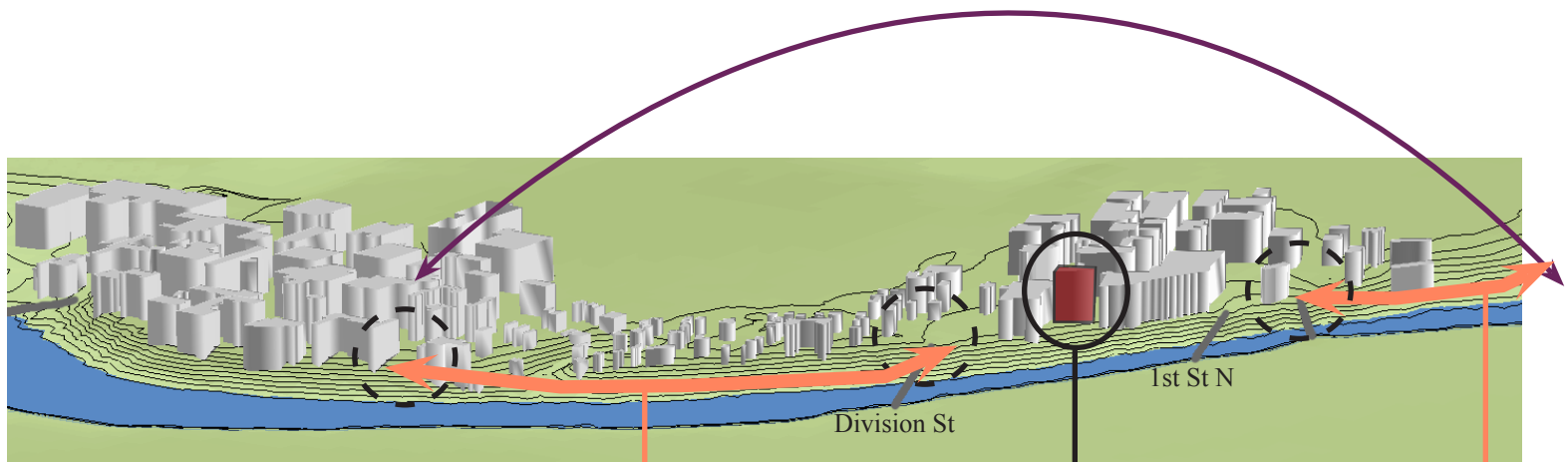


Building Heights

Half Mile



The River Corridor



- Provide riverfront trail
- Connect the University to Downtown

- Re-orientate area towards the river
- Link to downtown

- Continue riverfront trail

Unifying The River Corridor

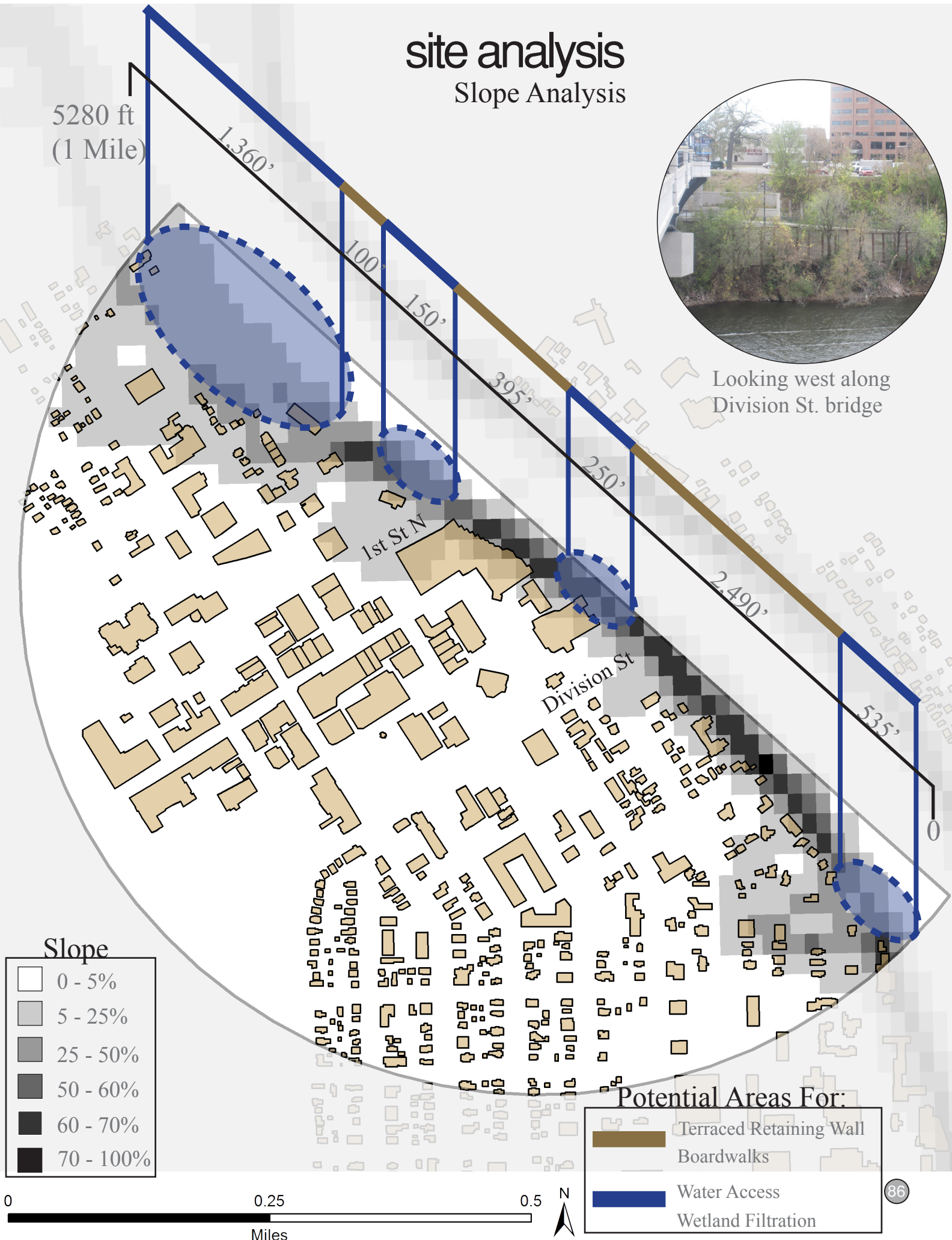
Join to existing trail

site analysis

Slope Analysis



Looking west along
Division St. bridge



site analysis

Typical Mississippi River

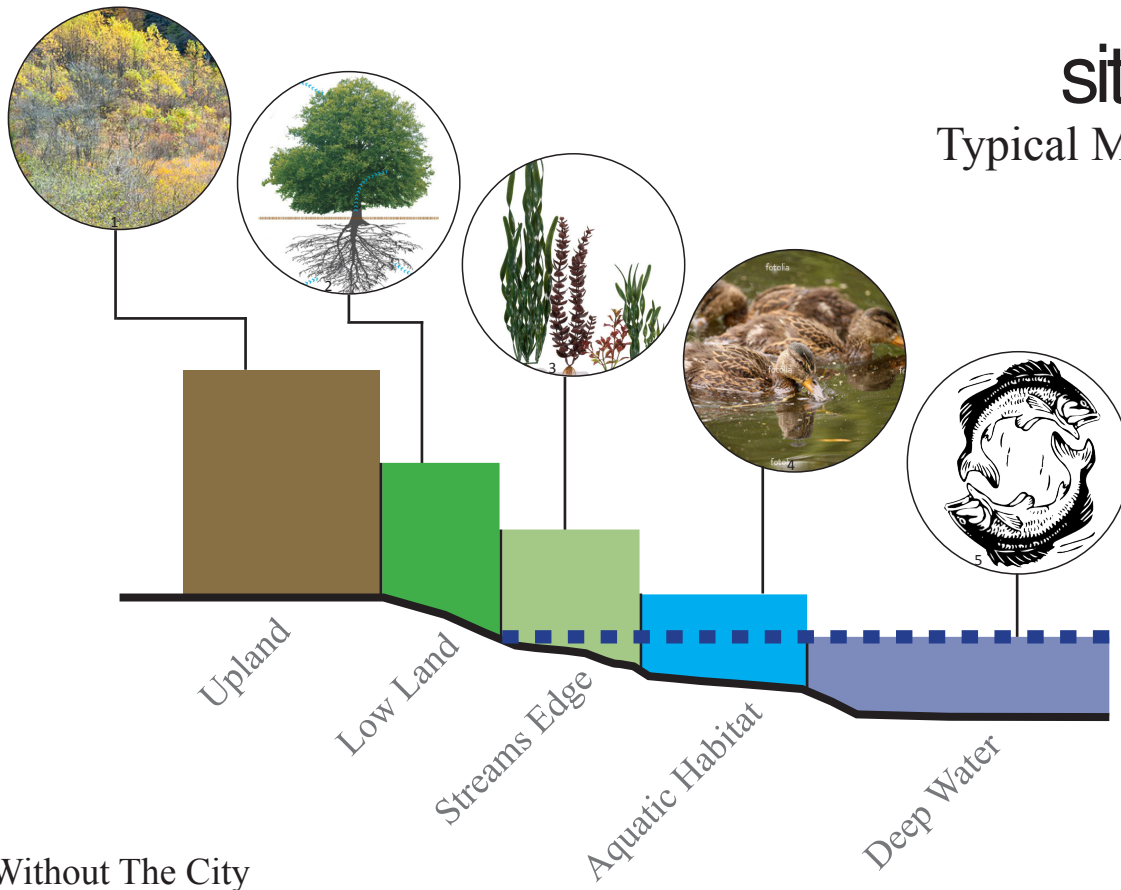
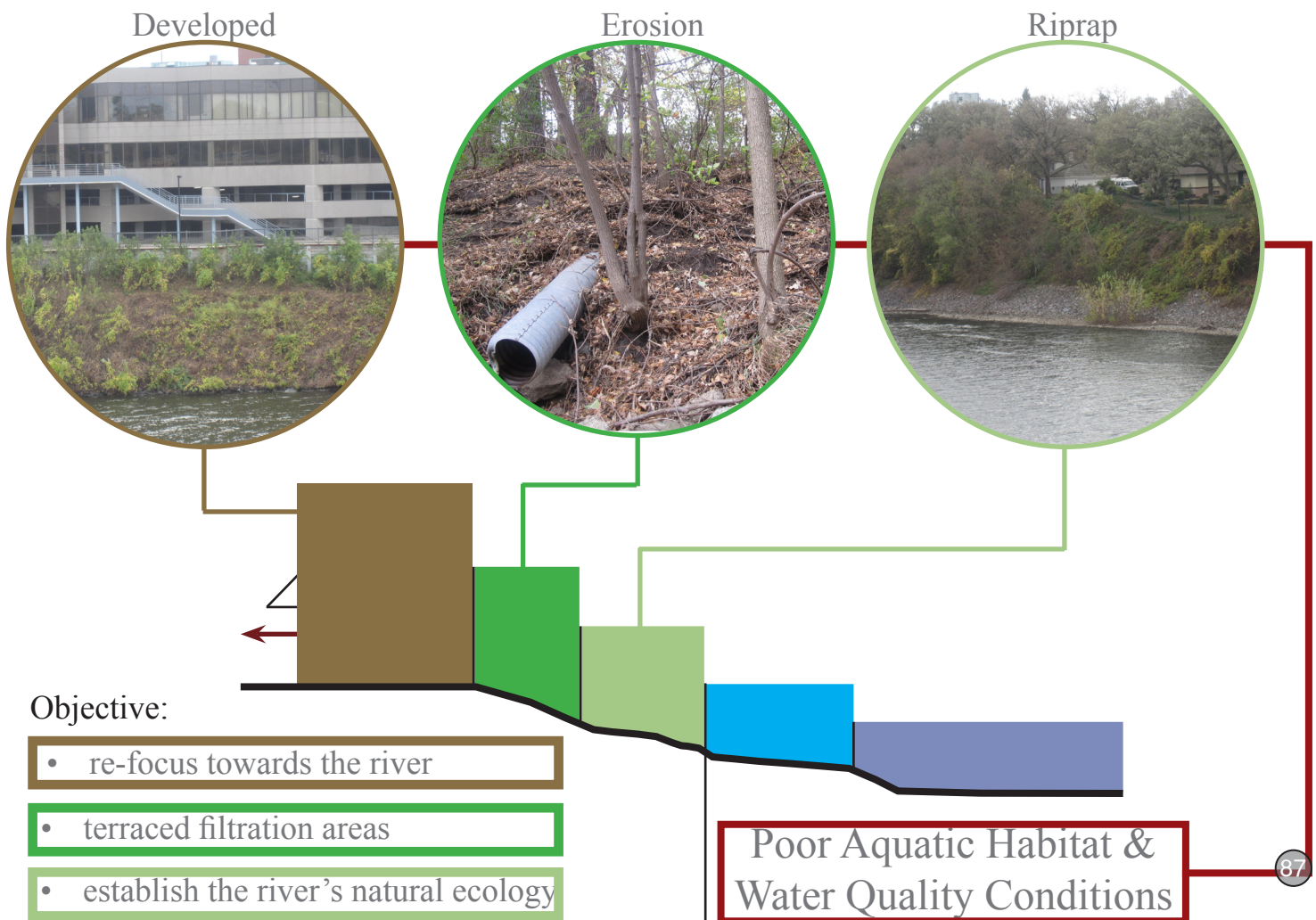


Image Source

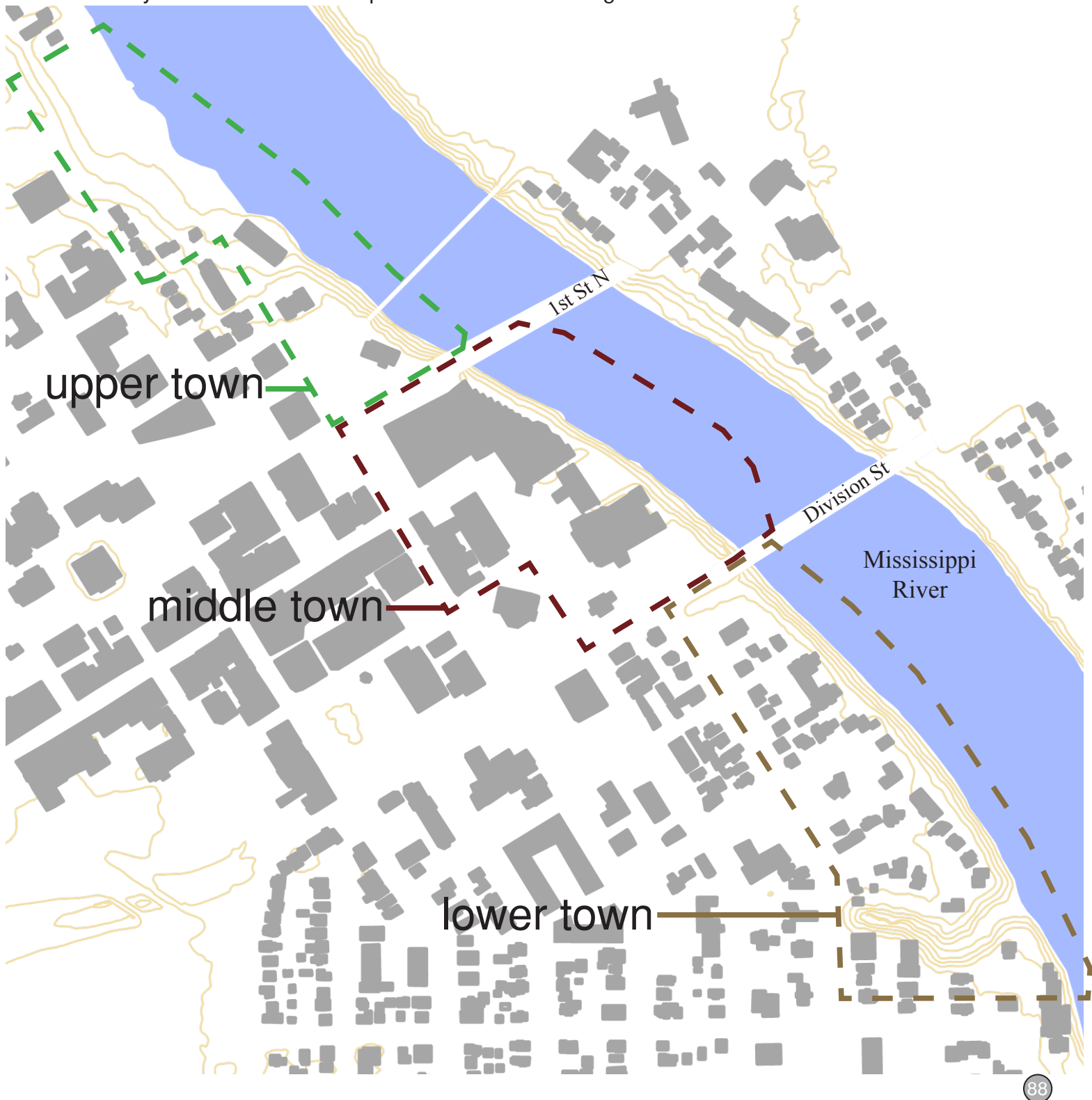
1. <http://dollysodsp photography.photoshelter.com/gallery-image/Fall-2009-Portfolio/G00004IBzvglic1k/10000pGsuov3leG0>
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3. <http://www.petworldshop.com/pictures/water-wonders-aquatic-plant-multi-packs.jpg>
4. <http://www.fotolia.com/id/14279731>
5. <http://www.cikr.com/clipart-11815.html>

With The City



Historically Developed

Historically St. Cloud was developed around 3 small villages



reconnecting to a forgotten river

an ecological solution

Introduction

The design approach for Reconnecting to a Forgotten River in St. Cloud, Minnesota, is an ecological solution that will re-link the urban core to the Mississippi River. This is done by creating a one mile riverfront trail system that connects to existing trails and links the St. Cloud State University District to the Downtown District, providing public destinations, riverfront access, riverfront views, and recreational areas, protecting sensitive habitats, and creating green stormwater management systems.

The inventory and analysis concluded that there are three main elements that the design will be focused around ecological renewal, reconnecting to the riverfront, and linking social and cultural facilities. These three elements define three different areas along the riverfront trail: upper town, middle town, and lower town. (The locations of these towns are located on the next page)

Upper Town | Ecological Renewal

This river corridor will look to provide river access for watercrafts, interaction with water, green open space, increase habitat diversity, and public trails to create a unified ecosystem.

Middle Town | Reconnecting to the Riverfront

This river corridor will look to provide a strong connection to downtown and the Mississippi River with overlooks, event areas, small plazas, and public destinations for pedestrians and riverboats.

Lower Town | Linking Social and Cultural Facilities

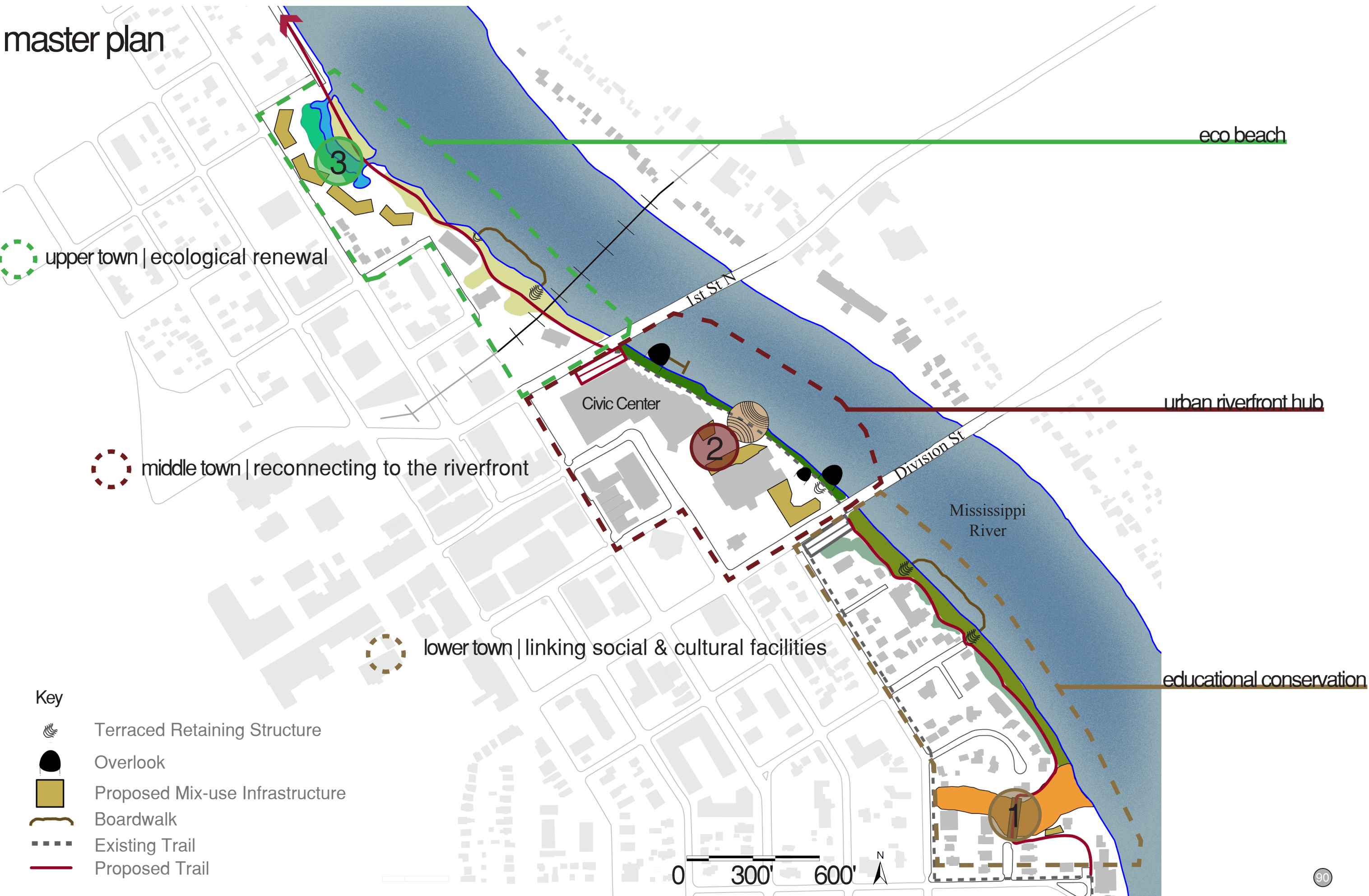
This river corridor will look to provide a vital social and cultural identity while protecting sensitive habitats. It is essential to create a strong connection between St. Cloud State University and downtown.

Program

Each town/district will have one focal design intervention taking place.

In upper town there is the Eco Beach, in middle town there is the Urban Riverfront Hub, and in lower town there is the Educational Conservation. (The locations of these programs are located on the next page.)

master plan



riverfront trail characteristics

Each town has different characteristics that are unique to its setting. This means the trail will be designed to fit the character of each town (upper, middle, and lower). This will give users an acknowledgment of when they have reached the different towns, however, materials and informational kiosks will be used to create one unified trail system.

Upper Town | Ecological Renewal

Majority of upper town has the lowest incline of slope and the greatest setback of buildings which will make this area effective for revitalization, slope stabilization, and stormwater filtration.

Middle Town | Reconnecting to the Riverfront

Middle town is St. Cloud's commercial district with the steepest riverbanks which creates the need of retaining wall structures.

Lower Town | Linking Social and Cultural Facilities

Lower town is home to one of St. Cloud's neighborhood historic districts. It is important to create a public path that doesn't interfere with the local residents.

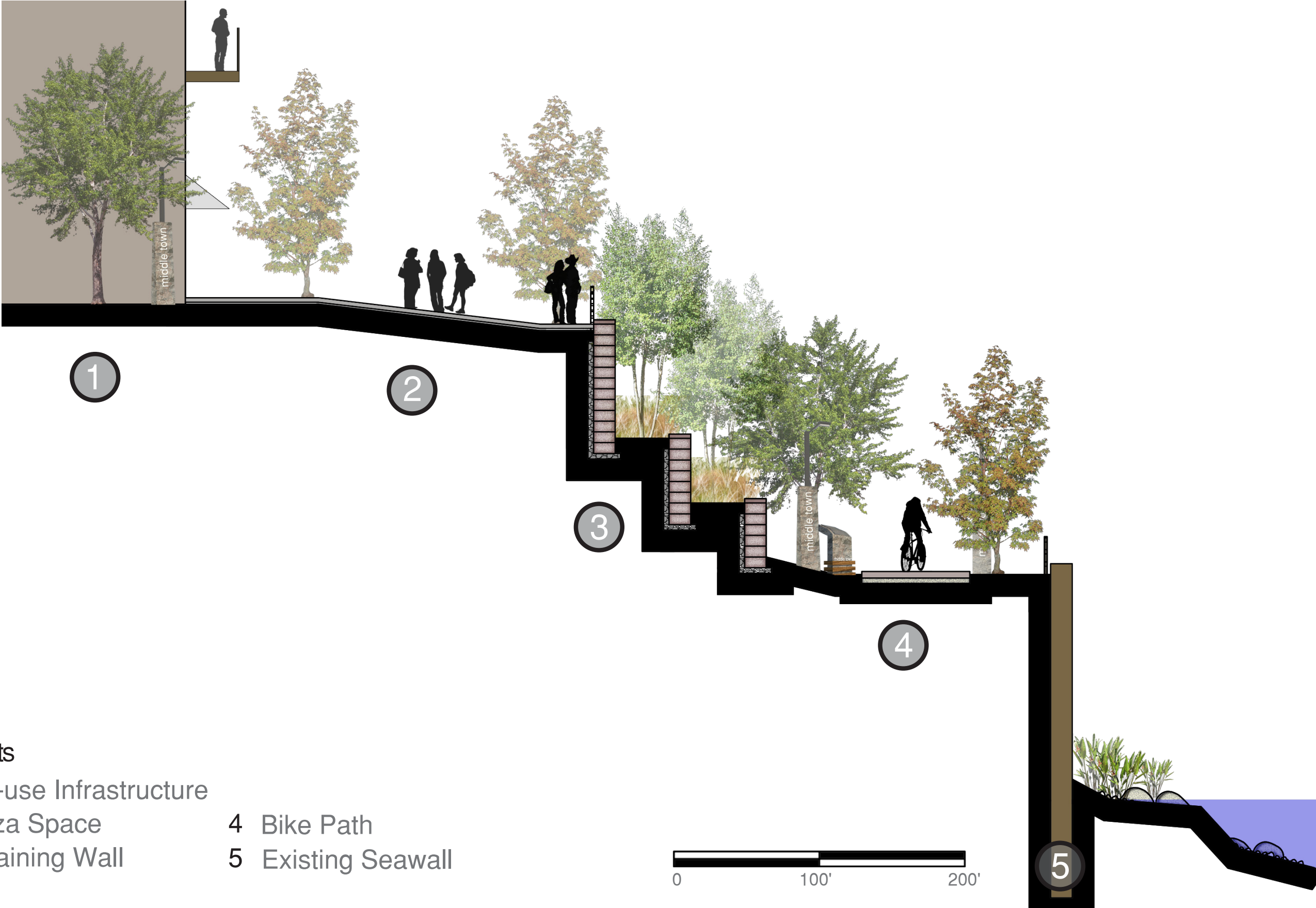
typical upper town section



- elements
- 1 Bike Path
 - 2 Filtration Swale
 - 3 Root Wad



typical middle town section



elements

- 1 Mix-use Infrastructure
- 2 Plaza Space
- 3 Retaining Wall
- 4 Bike Path
- 5 Existing Seawall

typical lower town section



eco beach

Eco Beach is located in upper town and focuses on ecological renewal. After talking with the city of St. Cloud's Planning Department, they stated that this area has the greatest opportunity for major design involvement. This is the primary design intervention for this thesis, which will set the standard of riverfront design along the Mississippi River corridor near St. Cloud, Minnesota. Principles, solutions, and techniques used for Eco Beach is an example of the way a river corridor can successfully create an aesthetically pleasing, environmental friendly, and socially and culturally diverse riverfront.

This area is for all users to interact with water and enjoy the great Mississippi River while protecting its natural ecosystem. Eco Beach is an ecological solution for the Mississippi Riverfront in St. Cloud, Minnesota.

Elements

- Interaction with Water (Swim)
- Improve Boat Landing
- Canoe Access
- Wetland Filtration
- Green Stormwater Management
- Increase Habitat Diversity
- Green Space
- Mix-use Infrastructure

Trees

- red maple
- sugar maple
- paper birch
- bur oak
- honey locust
- common hackberry
- quaking aspen
- chokecherry
- basswood
- cotton wood
- willow

Seed Mix

- mixed height/mesic grass mix
- tall wet grass mix
- shoreline grass mix
- northern upland meadow grass mix

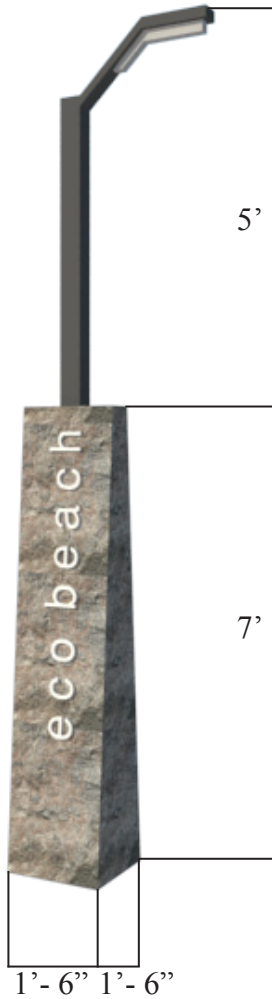
Materials

- local granite
- epy wood

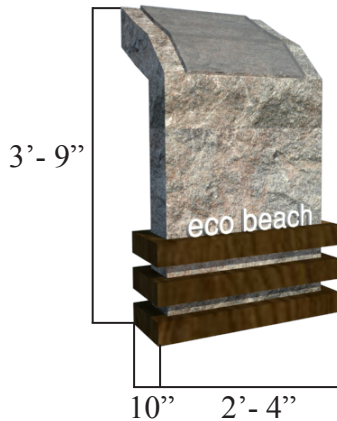
eco beach
master plan



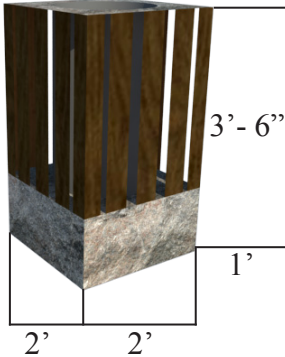
eco beach
site furniture



light post



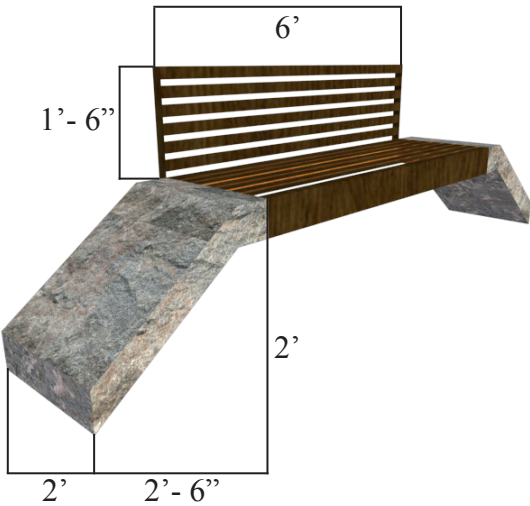
kiosk



garbage bin



path light



bench

Ⓐ south entrance to eco beach



eco beach

B canoe | kayak landing



C stand up paddle boarding through recreational waters



eco beach

D boardwalk view of eco beach



E balcony view of eco beach



urban riverfront hub

Urban Riverfront Hub is located in middle town and focuses on reconnecting to the riverfront. After talking with the city of St. Cloud's Planning Department, they stated that an existing hotel is proposed to relocate, which creates a great opportunity to provide a riverfront hub. This area will be able to congregate large events that can be co-hosted with the neighboring Civic Center. The main goal of the Urban Riverfront Hub is to create a public riverfront destination that will connect the downtown commercial district to the Mississippi River.

Elements

- Plaza
- Amphitheater
- Terraced Lawn Seating
- Public Events
- Informational Kiosks
- Interpretive Stormwater Management
- Water Feature
- Exhibit Display
- Mix-use Infrastructure

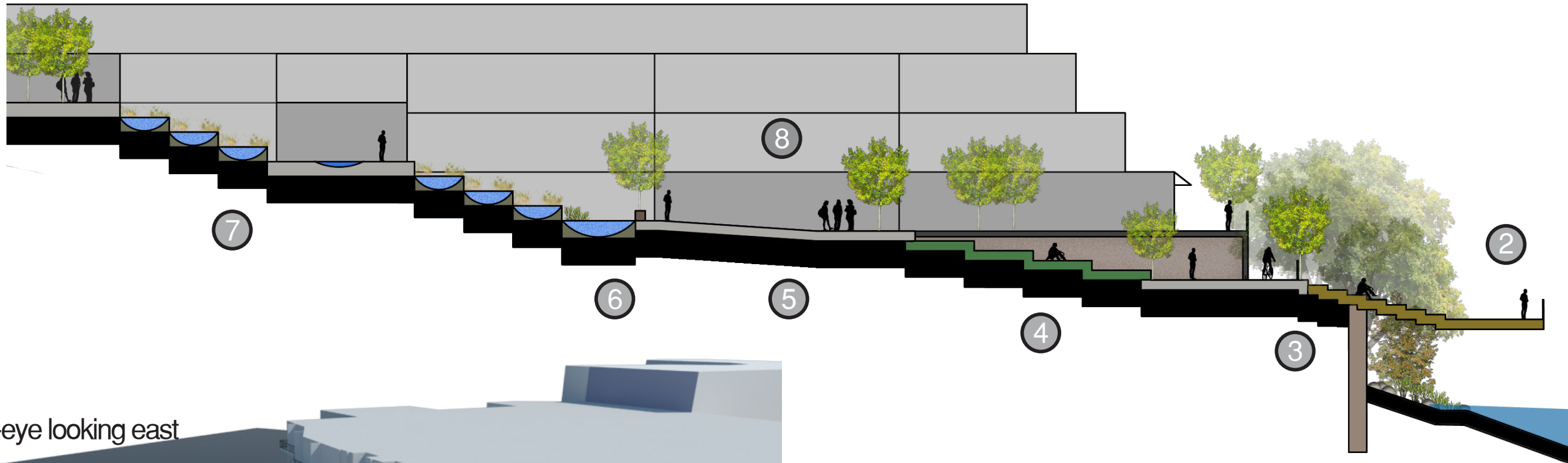
urban riverfront hub

master plan



urban riverfront hub

section



Ⓐ birds-eye looking east

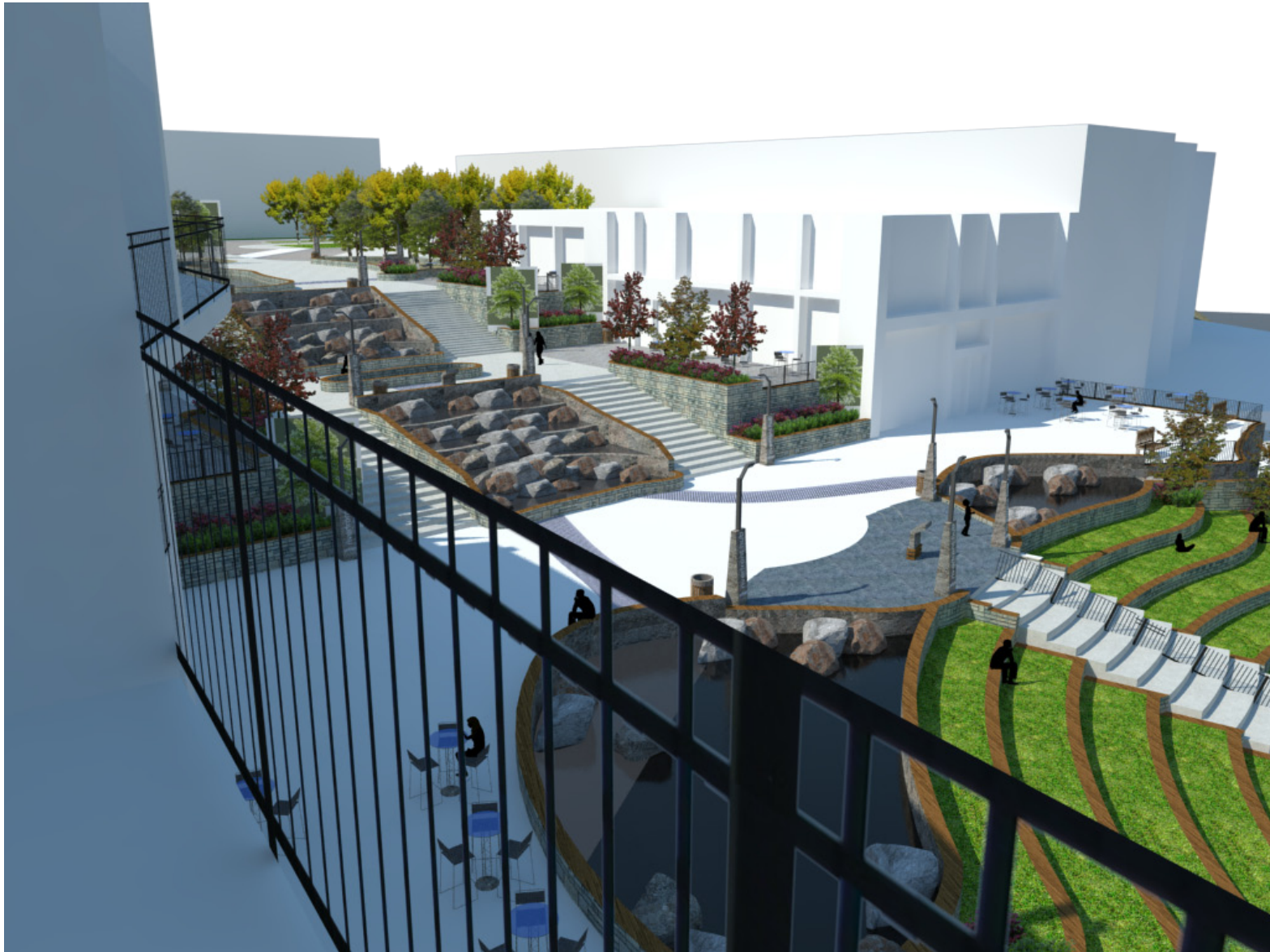


elements

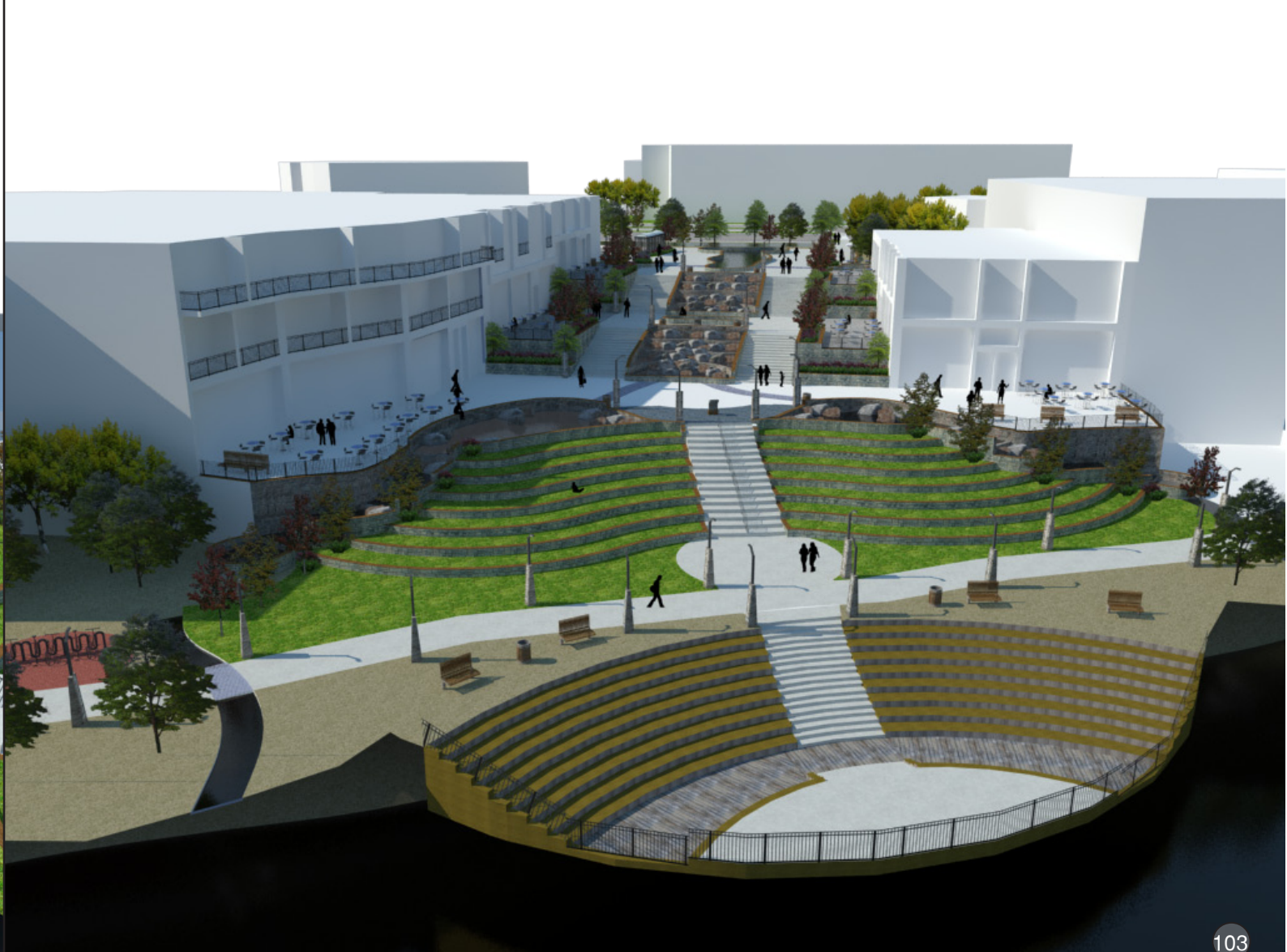
- 2 Amphitheater
- 3 Bike Trail
- 4 Terraced Lawn Seating
- 5 Plaza
- 6 Water Feature
- 7 Interpretive Stormwater Management
- 8 Mix-use Infrastructure

urban riverfront hub

Ⓑ balcony view



Ⓒ birds-eye looking west



urban riverfront hub

① overlooking the mississippi river



educational conservation

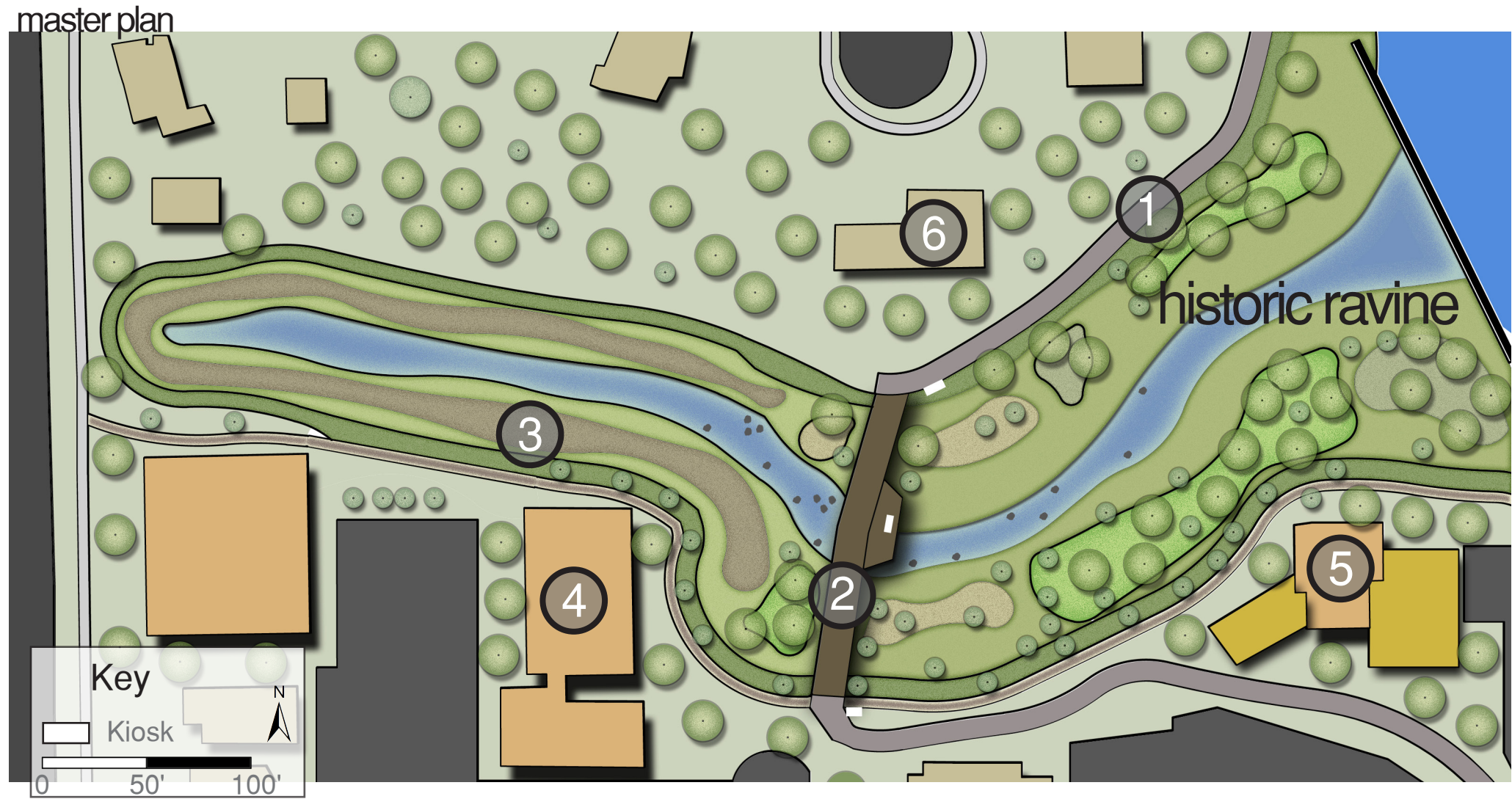
Educational conservation is located in lower town and focuses on linking social and cultural facilities. After talking with the city of St. Cloud's Planning Department, they declared this historical ravine to be undeveloped because of a native silver-haired bat that is currently under the Minnesota DNR species of special concern list. This challenged the original conceptual design; however, the common goal of creating a strong connection from St. Cloud State University to the downtown commercial district was still able to be provided.

This area has been designated to be a bat conservation where native plantings will act as a buffer to protect bats and a pedestrian bat bridge will be designed to provide a new habitat for bats. Natural bat habitats are diminishing such as caves and old growth forest; as a result, bridges are becoming bat havens of last resort (Weeley, Tuttle, 1999, p. 8). Information kiosks about the bats and the historic ravine will be located around the paths and the bridge.

Elements

- Bike Trail
- Pedestrian Bat Bridge
- Native Plantings
- Mix-use Infrastructure
- Re-use Infrastructure

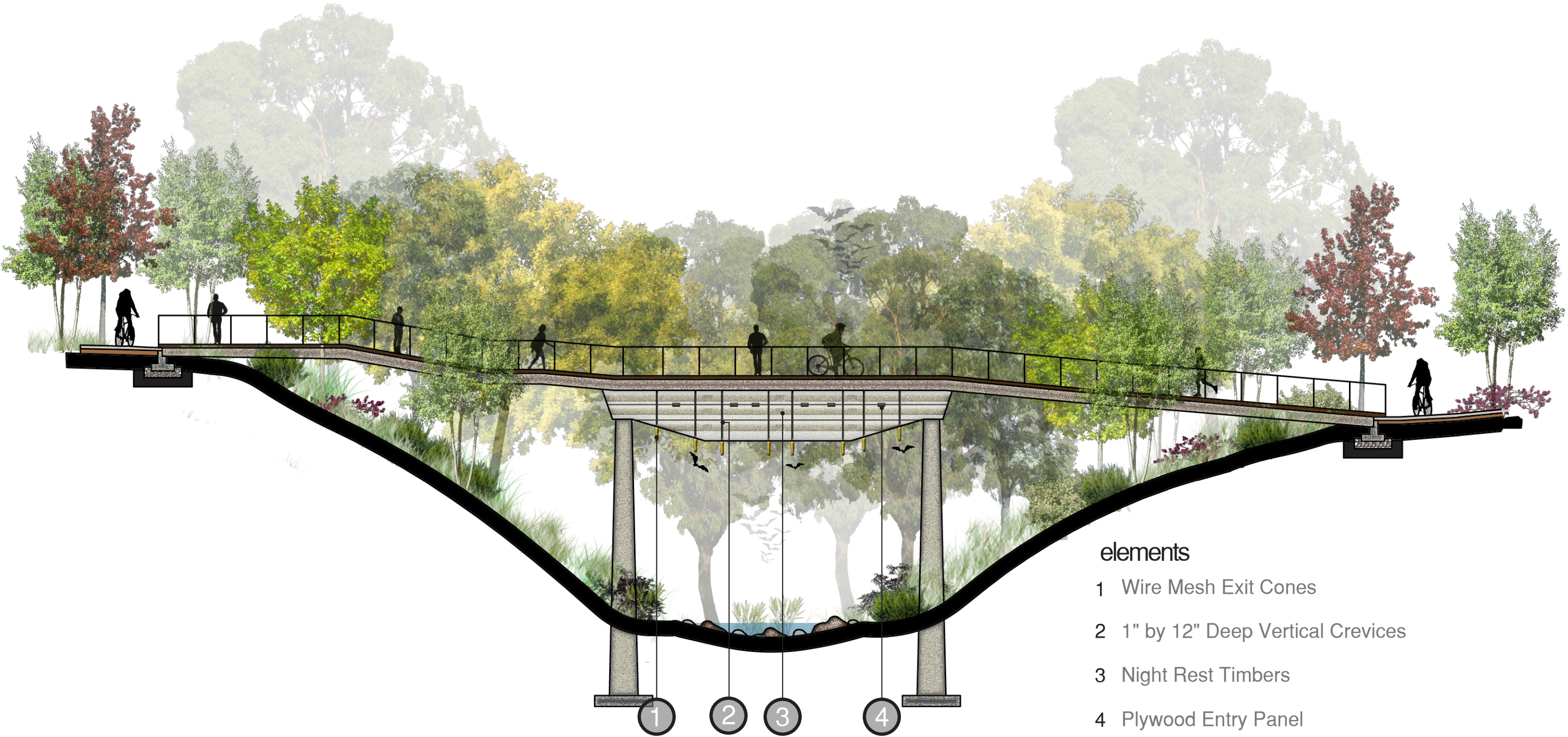
educational conservation



- elements
- 1 Bike Trail
 - 2 Pedestrian Bat Bridge
 - 3 Native Plantings
 - 4 Mix-use Infrastructure
 - 5 Re-use Infrastructure
 - 6 Existing Infrastructure

educational conservation

pedestrian bat bridge section



elements

- 1 Wire Mesh Exit Cones
- 2 1" by 12" Deep Vertical Crevices
- 3 Night Rest Timbers
- 4 Plywood Entry Panel

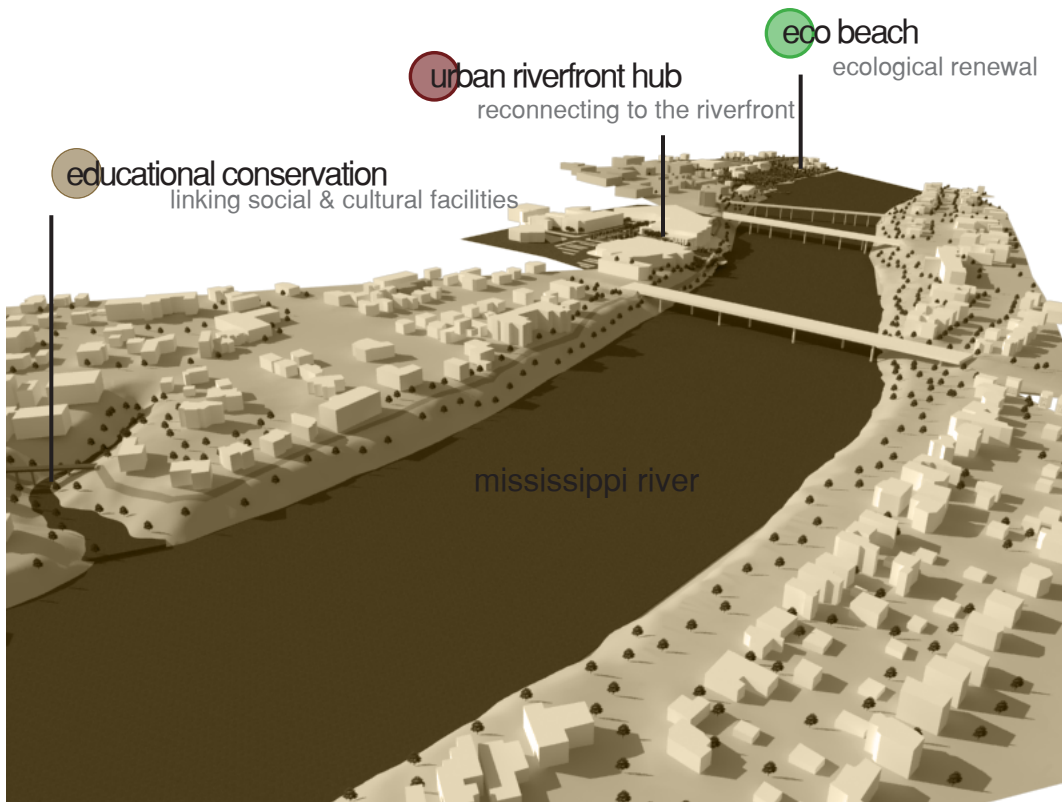


reconnecting to a forgotten river

an ecological solution

Conclusion

This design thesis examined the importance of the Mississippi River to its urban community and how riverfront design can function as a unifying element for a city's center and its ecosystem. Eco Beach, Urban Riverfront Hub, and Educational Conservation set the foundation for a successful riverfront along the Mississippi River corridor in St. Cloud, Minnesota.



personal identification



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Landscape Architecture at NDSU has enabled me to grow as an individual and made me truly learn that you need to be happy with what you do.... but never be satisfied.

reference list

Above The Falls, 1999. Minnesota, BRW Group.

Bernardt, E. S., & Palmer, M. A. (2007). Restoring streams in an urbanizing world. *Freshwater Biology*, 52(4), 738-751. doi:10.1111/j.1365-2427.2006.01718.x

Black, S. (1979). San Antonio's linear paradise. *AIA Journal*, 68(8), 30-39.

Chandler M. How Denver got its river back. *Landscape Architecture* [serial online]. November 2002;92(11):86.

Custom degree day data. (2011). Retrieved from <http://www.degreedays.net/>

Eckhardt, G. (n.d.). The edwards aquifer website. Retrieved from <http://www.edwardsaquifer.net/sariver.html>

Garvin, A. G. (2000). Parks, recreation, and open space: a twenty-first century agenda. Chicago, IL: American Planning Association.

Gibson, L. R. (2003, September 23). Growing degree-day calculation. Retrieved from <http://www.agron.iastate.edu/courses/agron212/Calculations/GDD.htm>

Greenberg, K. (1991). Rivers in the city. *LA Journal*, 81, 35-35.

Hammatt, H. (2002). Going with the flow [San Antonio River]. *Landscape Architecture*, 92(1), 72-77.

Keeley, W. B., & Tuttle, D. M. (1999) Bats in American Bridges. Bat Conservation International, Inc. Publication No. 4

Kellert, S. (2005). Building for life: Designing and understanding the human-nature connection. Island Press.

Minneapolis parks and recreation board. (n.d.). Retrieved from <http://www.minneapolisparks.org/home.asp>

Minnesota. (1975). A management plan for the Mississippi River: St. Cloud to Anoka. St. Paul: The Department.

Mississippi Interstate Cooperative Resource Association. (1991). Retrieved from <http://www.micrarivers.org/>

Otto, B., Leccese, M., McCormick, K. (2004). Ecological riverfront design: Restoring rivers, connecting communities. Chicago: American Planning Association.

"Preserve America." (n.d). Retrieved from <http://www.preserveamerica.gov/PAcommunity-stcloudMN.html>

Reps, J. W. (1994). Cities of the Mississippi: Nineteenth-century images of urban development. Columbia: University of Missouri Press.

San Antonio River Improvement Project. (2012). San Antonio River Authority. Retrieved from <http://www.sanantonioriver.org/>

figure reference

1. <http://www.micrarivers.org/>
- 2–4. <http://www.bing.com/maps/explore>
- 5-8. Garvin, A. G. (2000). Parks, recreation, and open space : a twenty-first century agenda . Chicago, IL : American Planning Association.
- 9-11. Kellert, S. (2005). Building for Life: Designing and Understanding the Human-Nature Connection. Island Press.
- 12-13. <http://dcmud.blogspot.com/2011/11/capitol-riverwalk-trail-gets-new.html>
14. <http://www.riverfront.org/parks/mortensen/>
15. <http://springfieldintruder.com/archives/2437>
- 16-21. Above The Falls, 1999. Minnesota, BRW Group.
- 22-24. http://www2.minneapolis.org/sites/default/files/u7/mm-images/V_GM_MM_Above-the-Falls
25. <http://www.edwardsaquifer.net/sariver.html>
- 26-33. Black, S. (1979). San Antonio’S linear paradise. AIA Journal, 68(8), 30-39.
- 34-35. Greenberg, K. (1991). Rivers in the city. LA Journal, 81, ,35-35.
- 36-40. Hammatt, H. (2002). Going with the flow [San Antonio River]. Landscape Architecture, 92 (1), 72-77.
41. www.sanantonioriver.org.
- 42-47. Chandler M. How Denver got its river back. Landscape Architecture [serial online]. November 2002;92(11):86.
48. http://www2.minneapolis.org/sites/default/files/u7/mm-images/V_GM_MM_Above-the-Falls.png
49. <http://www.sanantonioriver.org/>
50. <http://denverinfill.com/blog/2008/05/confluence-park.html>
51. Data from <http://www.nws.noaa.gov/climate/xmacis.php?wfo=mpx>
52. Data from <http://www.agron.iastate.edu/courses/agron212/Calculations/GDD.htm>
53. Data from <http://www.weatherbase.com/weather/weatherall.php3?s=55627&refer=&cityname=St.-Cloud-Minnesota-United-States-of-America&units=>
54. Data from <http://www.degreedays.net/>
- 55-58. Data from <http://www.weatherbase.com/weather/weatherall>.
59. Data from http://waterdata.usgs.gov/nwis/annual/?referred_module=sw&
- 60-61. Data from <http://www.southernclimate.org/products/trends.php>
62. Data from <http://water.weather.gov/ahps2/hydrograph.php?wfo=mpx&gage=scom5&view>
63. Data from http://waterdata.usgs.gov/nwis/annual/?referred_module=sw&
64. <http://www.preserveamerica.gov/PACommunity-stcloudMN.html>
- 65-68. <http://www.preserveamerica.gov/PACommunity-stcloudMN.html>
69. <https://mn-stcloud.civicplus.com/index.aspx?NID=250>
70. <http://www.preserveamerica.gov/PACommunity-stcloudMN.html>